80 U.S.

THE TRS·80 USERS JOURNAL

Vol. V, No. 8 $3 per copy August 1982

Education

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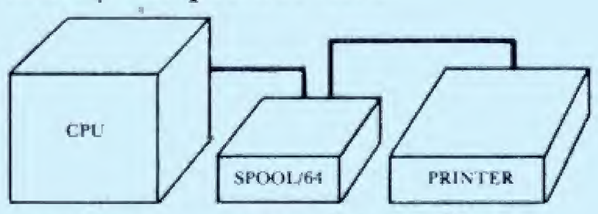

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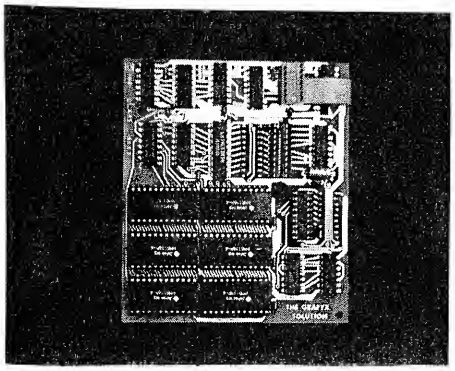

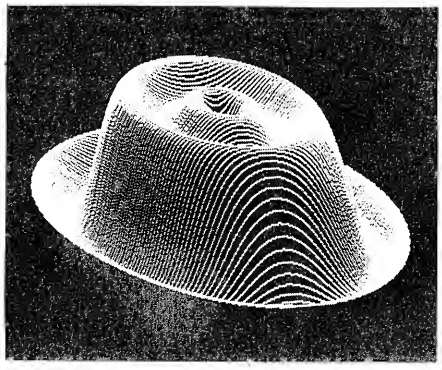

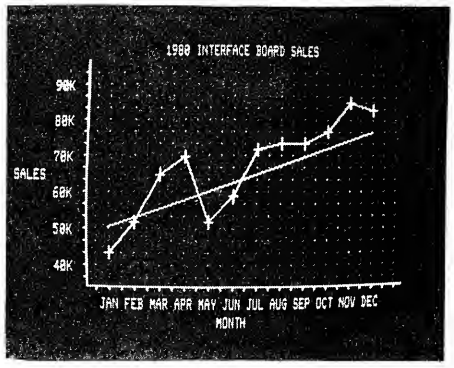

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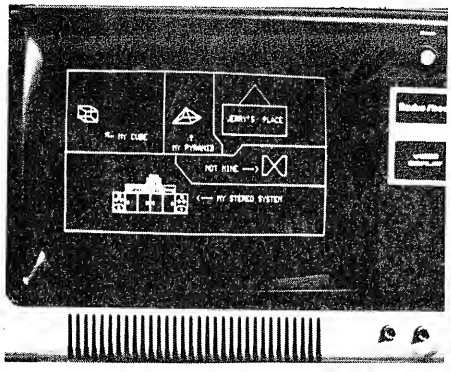

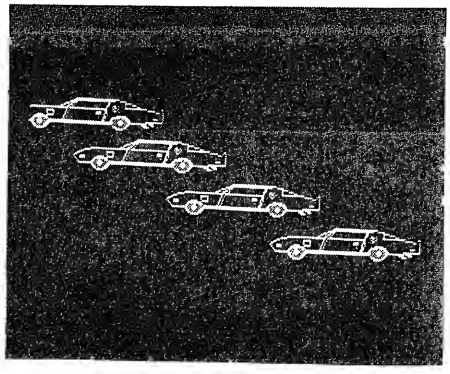

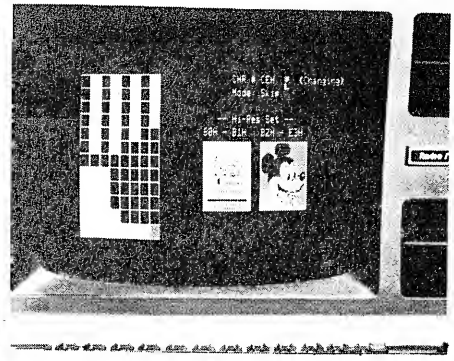

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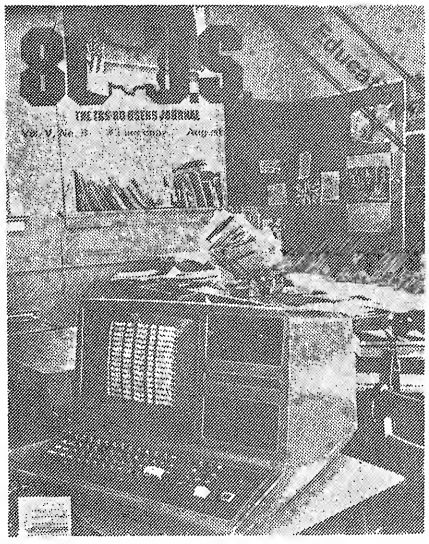

OUR COVER shows a Model III in a third grade classroom at Sheridan Elementary School, Tacoma, WA. Fred A. Johnson has photographed another fine cover for us!

80-U.S.
THE TRS-80 USERS JOURNAL

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Editorial

The introduction of the microcomputer to our schools has been touted as a revolution in education. I believe that it has been a flop.

Only after the micro has affected a complete cultural change will it become a true companion to education. Schools are very slow to be at the forefront of any major change, let alone technological advance.

Classroom instructors are being inundated with Computer Assisted Instruction, Computer Managed Instruction, Computer Aided Instruction, Computer Science, Computer Literacy, and a plethora of other C's. But the instructors do not have the time nor the inclination to do an adequate implementation. When the microcomputer was first on the market, I was ecstatic. It brought a world of wonder and excitement to my students. It allowed for creativity, problem solving, individualized instruction, structure and demand for detail. I loved it. But the problems are vast and must be addressed.

The People Problem

I have found most educators to be wary of the computer. They have been given little experience on any computer system and are not anxious to use machines that are not clear to them. Even today, most instructors do not use an overhead projector, video or other visual aids. Why should we expect something as complicated as a computer to be welcomed with open arms? Thirty years ago, television was going to be the panacea for education, yet most schools leave the telecourses to community centers and adult education, with a Sesame Street or Mr. Rogers thrown in for preschoolers. The classroom instructor tends to be very possessive of his time and the manner in which material is presented. The micros have yet to convince the instructor that they can do an adequate job for him.

Most instructors have a set syllabus, and will only adopt materials that will match their time schedule, or text, or emphasis on an idea. Only when a piece of software can be slipped directly into a given day's lesson plan will any teacher even consider using it.

Computer fear is an emotion that has been observed by almost everyone in the business. Educators are no different, their adoption of the micro demands that they first be exposed and educated, yet how many schools have spent even one-tenth as much on staff training as they have on hardware or software?

The Software Problem

Almost all software is sold on an as-is basis, with little or no user modification allowed. Most CAI that is currently offered is on the drill and practice level. An instructor is usually following a given text, but the software is not designed to match. There is little agreement on terminology or vocabulary and many times the instructor has to spend more time helping the student run the program than would be required to do the one-to-one tutoring. If software houses would also supply drill sheets, workbooks that coordinated with a given text, handouts for students and numerous other aids besides just a program, the teachers might be more apt to adopt their materials.

Computer-assisted management offers no real bonus to the classroom teacher. How many instructors are really gaining time by having grades and scores maintained on the machine? Most intructors have to keep a written log of scores, attendance and other data; what advantage is there in having to reenter the scores at a keyboard? The end of the semester grading can be simplified by the computer, but most instructors either keep just a

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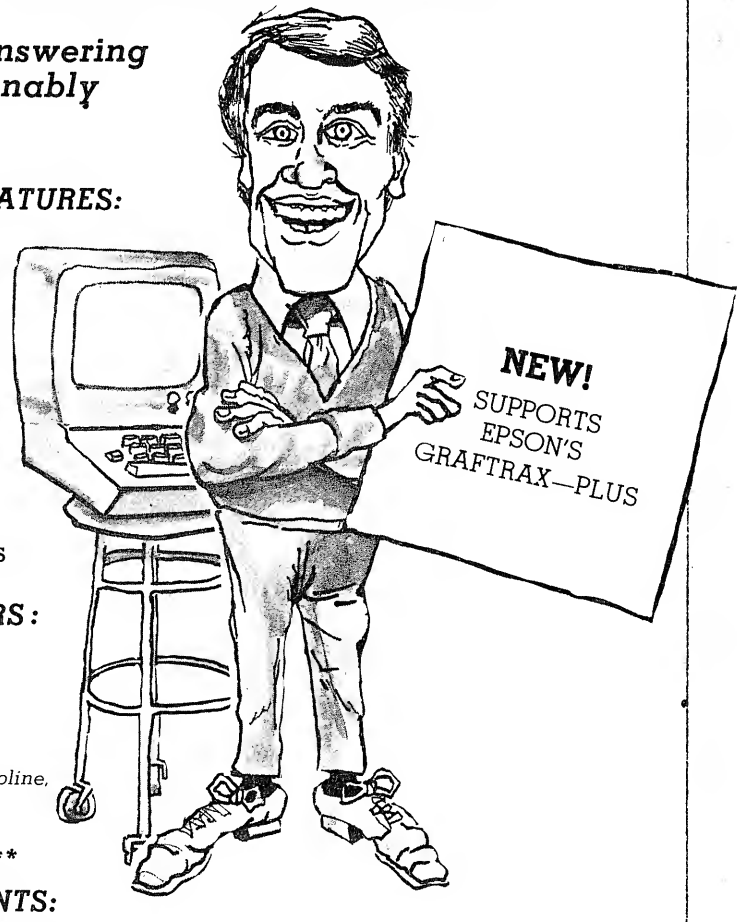

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the manual:

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the software: "An excellent Word Processor" (D.H.); "Absolutely fantastic" (S.E.S.); "You have features that I cannot duplicate on my $14,000 system" (J.B.)

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simple percentage scale, or base grades on a unique system that would defy even the most sophisticated of routines. Overall statistics are extremely valid for a teacher, but those that would make use of such data are not the ones that have to be convinced that a micro could be useful.

We have had software on everything from algebra to calculus for over a year, and our Math/Sci department has everyone trained in the use of the micro, yet the packages have not been touched. Why? It is still easier to write out a ditto and drill than to have students go to the computers. The problems involved with getting 30 students to work on six machines are just too much. By the way, I still find the programs to be excellent examples of software and a source of discussion, but do I use them regularly? No.

The Hardware Problem

Computers are not accessible to other classes. Even the simplest of micros is difficult to move (let alone the TRS-80 Model I with its multitude of wires and cables). The movement of ten machines from room to room is unrealistic. This means that instruction involving computers would require the scheduling into a computer room, moving classes around, insuring that a knowledgeable computer user is available for running the machines, all of which is an added burden to the instructor and takes away from the class time. What is the value of it all if you lose time just due to logistics?

The industry is still not standardized. Model I, II, III, 16, Color and Pocket are just from one vendor. Combine that with Apple II, III, Pet, Atari 400, 800, IBM, etc., and you have a hodge-podge of machines that do not communicate, or allow for compatibility. After mixing in a few different operating systems and specialized drivers, who knows anymore what will work with what? Only the teacher that devotes days to learning, reading, transferring programs, can keep up. Many schools have opted for just one system, not because it is the best, but because it is the only feasible way to manage it. But, are the students getting the best introduction if they only see one style of machine and language? Hardware and software compatibility would allow for choices to be made based upon merit, not just because it is the only method that will work on a given configuration.

The Game Problem

An earlier article by Leo Christopherson in this magazine pointed out how creativity and games go hand-in-hand. I agree completely, but how many educators have students who *write* games, not play them? Almost every teacher I talked to mentioned the amount of game playing that was being done. The students do find the computer a fascinating servant, but it is the rare student that will take the next step and attempt to program his own entertainment.

Our computer room is packed every day after school, and maybe only two terminals are being used for writing of programs, the rest are full of asteroids, clipper ships and star trekkers. CAI material goes begging. Games are fun, and they do point the way for educators. The best response from students has been given to simulations, those programs that turn a learning situation into a game. The programs from *Creative Computing* have been excellent, and our students used them. Getting the teachers to fit it into their lesson plan was harder.

If the games are a way to entice students to come to the machines, then by all means use them. But we have to offer more to the students once we have them hooked.

The Sex Problem

Also, it appears that the current situation is very male oriented, few schools can point to a balanced program. Where are the women? Most introductory classes have an equal number of men and women, but what happens after that? What are educators doing, or what image is being presented, that results in so few women getting really involved with the terminals?

There is no physiological or psychological reason for what is happening, but why are the women not showing up? If anything, their early development of hand-eye and fine motor skills says that the typing and attention to detail would be easier for them than the male students. Age also appears to be a key factor. The occupants of computer rooms tend to be underclassmen. Working on computers and holding a driver's license appear to be mutually exclusive events.

I do not mean to be a prophet of doom and despair. The potential is phenomenal. I have seen 15- to 18-year-olds make the computer jump through hoops. I have seen the dedication and involvement of a number of instructors. (If only running a computer room from 2:30 to 5:30 every day was funded as well as coaching!) What I am calling for is a concerted effort on the part of hardware and software manufacturers to look at education from the average classroom teacher's point of view. Once the teachers can call themselves computer users, the revolution will be a breeze.

Cam Brown

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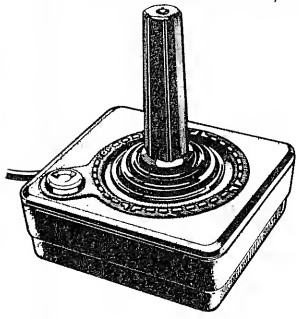

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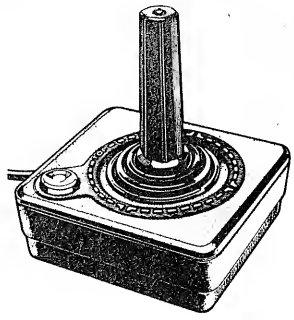

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Letters to the editor

Dear Don,

I received my June 1982 issue of *80-U.S. Journal* today and read the article on my chess program at least five times. I loved it! I still laugh when I think of you falling backwards over your chair from the sound of the "audio alert".

Sfinks may be a good program but without an enthusiastic article like yours, it would go on, unnoticed. Thank you. Maybe the moisture you saw on your monitor was a tear of my appreciation. Sincerely,

Bill Fink
Pompano Beach, FL

It was our *pleasure. —Ed.*

Dear Mr. Hall

Congratulations on your appointment as @NEWS column editor! I'm also a Stringy Floppy enthusiast and have followed your S-F articles with great interest!

I really believe one of the greatest needs of those equipped with S-F is the ability to convert disk programs to use on the S-F wherever possible. In the past, I've mentioned this to Jim Perry and also Exatron.

A series of tutorial articles incorporating the proper approach (and accompanied by S-F programs, etc.) would probably be the way to go. Exatron, so far, hasn't filled this need.

I believe this is all the more necessary now with the proliferation of disk articles at the expense of S-F and cassette-equipped owners. Sincerely,

Daniel A. Armstrong
Las Cruces, NM

Dear Sir,

In @NEWS (June 1982) it is stated that one can save and load Exatron "stringy floppy" wafers with a 4 Mhz clock rate. Not true. I have the Holmes' Sprinter installed and find that my TRS-80 runs well with speeds up to 5.32 Mhz, but that the most the "stringy" will tolerate is 2.66 Mhz.

By the way, I don't understand all the praise for the Exatron system. While faster than cassette recordings, it is quite frustrating because one has to search the whole tape to find a file. And one has to go through twelve keystrokes to activate the unit. Furthermore, the I/O program must be loaded separately — another series of strokes — and when loaded, it often interferes with the program that is supposed to use it. What a difference from disks!

H. Hjortsvang
Walnut Creek, CA

Gentlemen,

...may I mention that I have three young teenagers who read your magazine and I find the ad from The Softcore Software Co. offensive.

It seems that people involved with personal computers should be above this "tacky" behavior. Adult book stores and X-rated movie houses are available to those with sexual hangups. Why degrade your magazine for the relatively small amount of revenue from this advertising?

Joe Ames
New Ringgold, PA

Gentlemen,

The reason for this letter is to express my reaction to the obvious goals you have for yourselves in connection with *80-U.S. Journal.* Your choice of editorial material is intuitive and meets the needs of a hobbyist. Stick with your intuition. Your paper is easier to read, and your type size is legible. I guess you're after more advertising, but for goodness sake, leave room for editorial matter...

Stephen L. Javna
Englewood, NJ

Our editorial aims and goals were set with our first issue in September 1978. They haven't changed much since then, probably because they were broad enough to cover what came afterwards. We have always been less than 50% advertising, we don't like "continued from the front to back" articles and we still hope to provide the reader with enough value in each issue to justify the whole subscription price. — Ed.

Good morning:

We are neophytes in the world of computers . . . the new breed, to whom the computer is but a tool — albeit an effective one — to be put to work to process office chores. The school of hard knocks has been our instructor, and we try not to make the same mistake twice. Perhaps your readers would be interested in our experiences and decisions.

Salesmen are a poor source of advice on computers and comparable quality. Secondary school students are little better. Each is biased toward the single line of equipment they are familiar with. Fortunately, we sought advice from throughout a wide area of users and programmers. We discovered first hand the importance of the word "support". . . again, fortunately, before we made the decision on equipment purchases.

Ours is a small, but busy concern. We cannot afford to be "shut down" because of equipment/software failures. Our decision — the TRS-80 Model III. The support provided by the Tandy Corp. and the service network they have established have proven this to have been a most wise decision!

Our accounting requirements demanded computerization. Excellent AP/AR/GL programs are available for the Model III, but only one possessed the features we were looking for — Mini-Biz by Nepenthe Programs, of California. Problems? Certainly. Most of them due to our inexperience. However, we are impressed, again, with the tremendous support we have received from Nepenthe. In an instance or two, features we were looking for have been added by Nepenthe because they made an already excellent series of programs even better.

Most importantly, both Radio Shack and Nepenthe realize the

importance of providing their support and assistance when *we* need it; not when it is convenient for them.

We have learned, and are learning. Investigate. Evaluate. Weigh carefully, feature against feature. Discount, in most instances, at least 50 percent of the "advice" given by purveyors of equipment and software. Contact users! *They* are the real sources of information!

Perhaps some of your readers can benefit from our experiences. Hopefully, they too will become as pleased and satisfied should they try products with the backing and support of the quality of Tandy Corp. and Nepenthe. Have a good day.

Richard A. Rechlicz
Executive Secretary
Wisconsin School Bus Assn.
Brookfield, WI

Dear Mike,

A postscript to Mr. Walt Crede's letter in your June 1982 issue: We received a copy of that letter, and after calling Mr. Crede to discuss requirements, it was apparent that a better way of handling control key functions was needed. This was even more important with NEWSCRIPT Release 7, since there are 19 sub-functions for control, many of which are on the left-hand side of the keyboard.

Our solution was to lock the control key for one keystroke, during which time the cursor indicates control mode. Control does not have to be held down thereafter, and pressing any sub-function key both executes the sub-function and also releases the one-stroke lock. This means that NEWSCRIPT now can be operated with one hand, or even just one finger.

The capability is standard in NEWSCRIPT, and may be of interest to others who can use only one hand when typing.

Chuck Tesler
Prosoft
North Hollywood, CA

This letter is *ex post facto* as I have been using one of your articles for so long and enjoying your publication as well that I think it is high time I wrote and told you so.

The write-up was "Survival" by Spencer Hall in the March/April 1981 issue and I have been using it ever since. I have a Model I Level II with 48K and a Lineprinter VIII. It is a cassette function which I hope to rectify by including a disk set-up.

Because of the cassette operation it is really hard to run a decent budget program. Now, Survival doesn't do the budgeting for me, but it really helps keep track of the money and which bills were paid on whatever date.

I believe that Spencer (if he hasn't already) should get a real round of applause for this one, it's the best I've seen in any magazine. I hope that he will come up with another program equally as well done as this one was.

Lorne L. Gordon
Edmonton, Alberta, Canada

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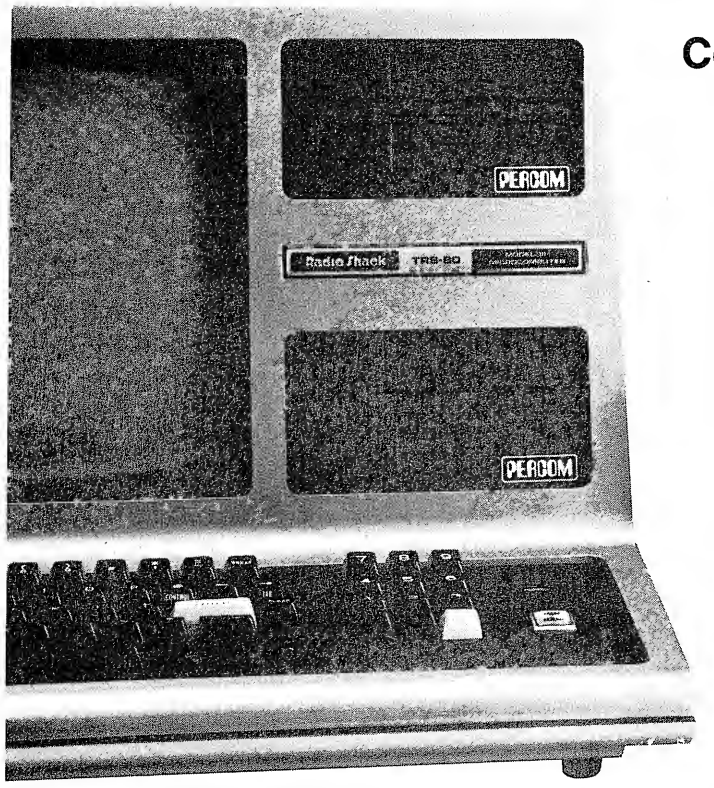

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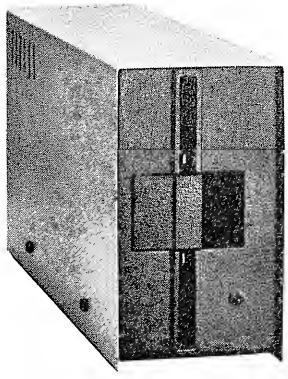

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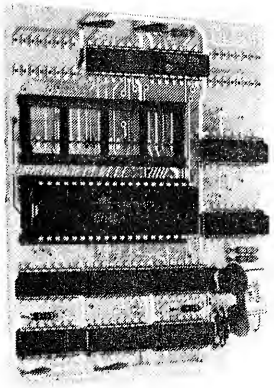

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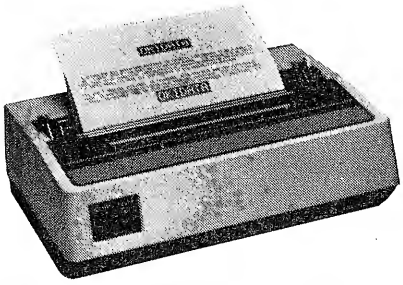

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Items at random

The circulation of *80-U.S. Journal* seems to jump in fits and starts. Seems we hold for awhile, then make a leap. For example, the July issue went to over 5,000 new readers! If this happened every month, we'd be bumping heads with the big boys but fortunately (or is it unfortunately?) it doesn't.

One thing about printing more copies is that our mistakes are copied just that many more times. Here are some corrections for past issues.

Corrections

Jerry Latham has written to tell us the following:

"This to inform you of errors in the program listings that accompanied the first installation of my three-part article published in your June 1982 issue. The article was titled "Checkbook". The errors are all (darn it) in the listings. Luckily, they are minor and most readers will probably fix them on their own. But, I owe it to them to provide the proper code.

The first error is in Listing 1, line 600. The last statement should have a comma between the quote mark following the filename BUILDALL and the V. Examples of the correct format are lines 100 through 500.

The second error is in Listing 3, line 10190. The variable called AC in the string build command (it is in parentheses immediately preceding the second plus sign in the line) should be variable ZD.

The third error is in line 10 of Listing 4. The FOR...NEXT loop is set up wrong. The FOR statement in that line should read "FOR Y = ZO TO Z1:" The Y= was left out.

Please pass on my apologies for any inconvenience this caused. They deserve better. I will be typing in the code in each of the three articles right along with them to help catch this type of error.

An additional note should be passed along. Listing 5 (PRINTCK) was designed using an Epson MX-80 without the Graftrax-80 option. I have since added the Graftrax option and find that not all of the codes are constant. The value in location 14312 actually "floats" during some operations. This causes this routine to give false error indications. The 191=Busy and 63=Ready status codes are valid. A possible quick cure for errors encountered is to delete lines 11030 through 11050 of that listing."

Then there is another letter from David S. Tilton, who wrote the NOTES on the Model II in the June 1982 issue:

"Why is it that mistakes are easiest to detect *after* they have been published? I found mistakes in the Model II information published in your June issue. A serious mistake concerns the address where the switch to video occurs. It should be F800H to FFFFH and not FF80H to FFFFH. If it started at FF80H that would provide only 128 bytes, nowhere near enough.

The next error deals with the refresh circuitry using wait states to hold off the CPU during the refresh period. At the time I wrote you I was under the impression that the refresh circuitry held off the CPU until retrace time. Not so. It only holds off the CPU until it has finished with the byte that it was processing at the moment. Since the refresh circuitry must be fast to keep up with the scan rate, this is not long, maybe a clock cycle or two. Even though my fears of excessive wait states were groundless, I still think that most programmers would be better off using the SVC via a USR call rather than with patched in PEEKs, POKEs, INs and OUTs."

In the @NEWS Column in June 1982 reference is made to a new 64K board for the Model I. The price indicated it was $19.95. This is incorrect. The correct price is $199.50.

In our April 1982 issue, page 32, the article titled "Un-number" makes reference to two program listings. Unfortunately, Listing 1 is incorrect. It should read:

```
65300 P=17129
65310 P1=PEEK(P)+PEEK(P+1)*
      256
65320 IF PEEK(P+2)+PEEK(P+3)
      *256=65300 THEN END
65330 POKE P+2,0:POKE P+3,0:
      P=P1:GOTO65310
```

Name the Company Contest

We received many really nice suggestions for the name of our book division. There were so many, in fact, that we are having a hard time picking out the one that fits best. We had settled on one, but found that it was already in use. We are busy looking for another. It is a large list from which to select. Please hang on another month while we make up our minds.

In This Issue

This is our educational issue. Our new editor, Cam Brown, takes a hard look at computers in education in his editorial. He should know, having spent some 15 years in the field and teaching computing for the last eight years.

Elsewhere, we have articles for the Color Computer, some with programs and one that keeps a student gradebook.

We take a look at the new Daisywheel printer from Smith-Corona, the DT-1 Terminal from Radio Shack and yes, I've got a Model 16 and give an overview of it.

There is an article on Supermonitors, one on the DUMP command and one on controlling your input commands on screen.

Captain 80 is off on his usual secret agent adventures and Terry Dettmann covers recursive programming in his Files and Foibles column.

We are also covering the results of our reader survey, taken last April. Of course, there is more, but no more space to tell about it.

Our next issue will feature graphics for all models. Enjoy this one, and we will see you in a month. Make yourself a wonderful summer!

Mike

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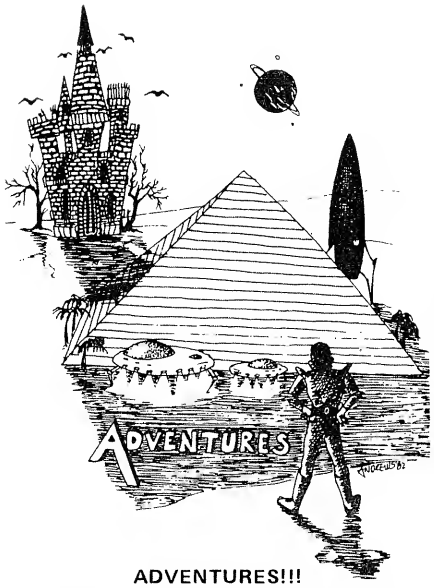

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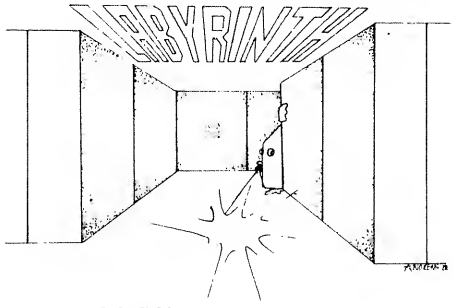

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#9

Computer revolution in public schools

The economic reality of purchasing computers

Hal Broenkow, Edmonds, WA

For over two years, I fretted that ours was the only high school in the country that was being denied the opportunity to use computers for instruction. This spring, however, an appeal to schools in our state who might be using the TRS-80 computer brought exactly one response. That came from a small private school. Most teachers seem to have had the same kind of luck in acquiring computers for their schools.

As a teacher, I am very aware that a school that does not teach its students about computers is not preparing those students for the world of tomorrow, or even for the world of later on today. In addition, many of us know that computers can do a very good job of teaching us about other subjects.

People who use computers and people who sell computers, nearly all agree that the information-handling ability of the computer, and the computer's nearly infinite patience, make it uniquely suited to teach.

Suddenly, a great deal of educational software is being offered for sale. A quick look at Radio Shack's latest computer catalog shows three pages devoted to displaying Tandy's "Commitment to Education." A number of the traditional publishers of textbooks are beginning to publish "courseware," as it has come to be called. Some of it works, although much of it is worthless.

It is tempting to say that computers are needed and are inevitable in the schools, both as a subject to study (computer literacy and programming classes) and as a way to learn (Computer Assisted Instruction). Unfortunately, the computer revolution is nearly invisible in the schools. Most of the students in our district's high schools will never use a computer unless it is at home or at a local computer store. Why? The answer in part, is money. It's enough to make a teacher wish for another Sputnik crisis, like the one in the fifties, that brought millions of dollars worth of teaching equipment into the schools.

Suppose that a four-year high school with an enrollment of 1000 made the decision to allow each student just one classroom period (out of five) on a computer for just one semester (out of eight). This would require the purchase of twenty-five computers — not enough for a full-size class in my school, where the average class size will be thirty-three this year. Picking the Color Computer, for no other reason than its price ($857 with a television and a cassette recorder), this would cost $21,425. Now (as they say), if you want a motor in your new car, that will cost extra. Ten percent might be a reasonable figure for software. Add in a little for such things as outlets for all those computers and you find that the minimum investment for such a commitment on the part of a school is about $25,000 for equipment. Labor costs (a teacher's time) would cost an additional $10,000 or more per year.

In my own school district, falling enrollment (the "baby boom" just passed) and reduced state funding has forced the district to lay off teachers and increase class size at all levels. The same thing is true in the majority of school districts around the state. The administration says that to purchase computers, they would have to lay off additional teachers. (I would regret this, because it would further raise class size. Thirty-three trigonometry students are enough, thank you.)

If there is a computer revolution going on, it is being well contained by both the economic restraints I have mentioned and by the conservative treatment of revolutionaries that (had the Tsar known about them) might have kept Russia a monarchy. Let me tell you what happened on the way to the revolution.

Three years ago, convinced that if I had a computer in my classroom, I would be able to do something good with it, I began requesting funds for one. After nine months of asking, I was told that the district was willing to buy a $1,000 computer.

With a single computer and five classes of thirty students, about all I was able to do was get a hint of the sort of things fifteen or twenty computers would make possible. Another nine months of asking got me another answer: "No." No money, so no computer.

Another several months of asking got me a louder no, in the form of a district-wide moratorium on the purchase of computers. This meant no, not just in my high school, but in the other twenty-five schools in the district too. Further questions yielded the answer that we had a committee working on the issue. Until the district Computer Committee could pick the best computer for school use and the best uses of the computer in the schools, no money would be available.

I soon found myself on the committee, asking the logical (I thought) question, "suppose that the committee finds that computer-

assisted instruction (C.A.I.) shows great promise, and that Brand X computer is clearly the best one. Will the district buy some computers then?

The answers were always vague and usually rather negative. The one that really made me twitch was that after the committee made its report, the district would have to hire a computer consultant to recommend the selection of a machine and the software to go with it.

As a twenty-year veteran of public education, I have some insight into the pressures felt by administration — pressures that require a documented rationale for any decision which affects policy or spends money. The paper trail laid in our own district was easily as expensive as a single computer of reasonable configuration, and perhaps as expensive as five of them, and our computer consultant has not even been hired.

The simple facts (our computer committee even agrees with me) are:

There is no one best computer on the market today. Schools need number crunchers, sophisticated BASIC and other languages, word processors, graphics displays, color, durability and simplicity. No one computer has all of these in good quantity.

If there were a valid answer to the hardware question today, the answer would be different tomorrow because of the rate at which the industry is developing new machines and changing existing ones.

Most of the software for education is junk. Any good teacher with a little training could write better material than most of the so-called educational programs. Simply putting a traditional workbook into a computer program usually results in a rather fragile and very expensive version of a paper workbook.

Publishers know better than to let teachers "review" a copy of an expensive program that is easily copyable by anyone with a computer to make it run. Any courseware purchased is therefore a pig in a poke. There is no good way to test it before buying.

Thus, deciding to purchase computers is a step that educational administrators and school boards are reluctant to take, both from the standpoint of dollars and of educational soundness.

The private schools, on the other hand, seem to be better able to make the commitment. They have several advantages (as seen while standing on the grass on my side of the fence). Being smaller, they are better able to make decisions in a short time. In some cases, they spend several times as much per year to educate each student. That leaves some room for discretion. In many other cases, the private schools pay much lower salaries to their teachers, which also helps to leave some money for computers.

The computer revolution, it seems, may be a little late in arriving in many of the public schools.

Back in my own district? Well, this year we have another committee. I'm on it. We're dealing with the question, "Where do we get $25,000?" One idea is that we ask businesses to contribute cash. What do you think will be the answer?

All I know is that it's hard to feel like a revolutionary when you're on the committee. ■

Computerize your individual educational programs

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Model I/III, 16K and up

Larry Krengel, Elmhurst, IL

Computers first earned their popularity as "number crunchers." They had the ability to boil down vast amounts of data into manageable numbers. Their computational speed amazed all. Today, computers still crunch numbers, but their popularity has spread to those who wish to crunch words: word processing.

Being an educator, I have need to communicate and record large amounts of information. This depends greatly on words, a field in which computers can now assist. More specifically, I am a special educator. I work with those students who have "special needs" (a term which founders of special education left appropriately vague).

My job is to deal with students who cannot benefit appropriately from the regular classroom. My colleagues and I deal with many different educational problems — mental retardation, blindness, deafness, learning disabilities, social adjustment . . .

Only a few years ago, the federal government passed a law governing special education. As with most areas in which the government becomes involved, the burden of paperwork multiplied many fold. Public Law 94-142 is the law that, among other things, requires an Individual Educational Program (IEP) for every special education student. Each IEP is divided into goals; each goal is divided into a series of short-term instructional objectives.

Wow, what a pile of paperwork! Multiply the number of subject (and social) areas by the number of goals, and that figure by the number of short-term objectives, and you have a nearly full time job without ever meeting with the student. To follow the law to the letter requires a very unusual person . . . or a computer.

One Teacher's Solution

I have had an interest in computers since my college years back in the 1960s. However, it was not until I acquired a TRS-80 in 1978, that I was able to put that interest to work helping to solve my paperwork burden.

Much of the paperwork required for an IEP is repetitious. The goal for Johnny is often the same as for his classmate, George. The law requires that I delineate a set of objectives for each as if the other did not exist.

Developing goals is time consuming, but it is done two, three, or perhaps four times a year. Short-term objectives, however, need to be developed much more often if they are to be effective. Weekly would not be unusual.

I have chosen not to hand write short-term objectives, but to have the computer write the objectives from a sequential library of objectives written for a specific subject.

The IEP Program

The accompanying program is written in Radio Shack Level II BASIC. It allows a teacher to deal with a group of five students at a time. Based on a bank of standard goals and objectives (listed in the DATA statements), he can plan for each student. When the objectives have been set, the computer's printer prints an "IEP Insructional Objectives" sheet for each student.

These sheets may be kept in a file by date of intended completion. On that date, the student's progress can be evaluated. A record of the evaluation is made in the space provided on the computer printout, using a rating scale which appears on each sheet. The completed sheet becomes part of the student's permanent file.

At this point, a new set of objectives can be set. My TRS-80 changes hours of work into minutes. To most teachers, that means less time for paperwork, more time for teaching kids!

How to Adapt This Program

My first recommendation is that a teacher develop a program for each individual subject area (i.e., one for math, one for reading, one for social skills, etc.). Once that is done, the teacher needs to develop a logical sequence of goals, and for each goal, a sequence of short-term objectives. The law then requires the teacher to state the methods to be used and the criteria for judging success. These are then entered as DATA statements, beginning at line 8000. I chose to use a different line for each objective. For example:

Goal — To develop better addition skills.

Objective — Student will learn to carry when adding two three-digit numbers.

Method — Teacher produced worksheets.

Criteria — 90% success.

This becomes:

8010 DATA To develop better addition skills. Student will learn to carry when adding two three-digit numbers. Teacher produced worksheets. 90% success.

When these DATA statements have been developed, the teacher needs to change the dimension statement in line 90 to reflect the number of DATA lines. In lines 100 and 300, the "FORX=1TO.." statements need to be changed to read all of the DATA lines. If an OS error should occur, either the clear statement (line 80) needs to have a larger value, or the number of objectives must be cut.

Printer Commands

The LPRINT statements are written for an Epson MX-80. These should work appropriately for most similar printers. The IEP Objective sheet is printed using expanded, condensed and standard print sizes. Where it is possible, the emphasized print is used (causing the dot matrix letters to look more like letter quality).

Most teachers entered education because of the desire to teach children . . . that makes sense. The burden of paperwork which weighs heavily on many (particularly special educators) can and should be, eased by the use of computers. With the sharp upswing in the number of computers in schools of all levels, the teacher's burden should be eased by the use of this tool. The development of Short-term Instructional Objectives is one place where the computer can make a significant difference.

Program Listing for I.E.P.

```
80 CLEAR5000
90 DIM G$(20),O$(20),M$(20),C$(20)
100 FORX=1TO20:READG$(X),O$(X),M$(X),C$
  (X):NEXT
110 CLS
120 INPUT"enter beginning date(M/Y) - "
  ;BD$
130 INPUT"          enter ending date - "
  ;ED$
140 INPUT"enter name of implementer - "
  ;IM$
150 INPUT"       implementer's title - "
  ;IT$
160 CLS
170 PRINT"would you like a copy of the
  library of goals? y/n";
180 A$=INKEY$
190 IF(A$="n")OR(A$="N")A$="":GOTO500
200 IF(A$="y")OR(A$="Y")A$="":GOTO300
210 GOTO180
300 FORX=1TO20
305 IFG$(X)=""GOTO500
310 LPRINTX;"  ";G$(X)
320 LPRINTTAB(5)"short term objective:"

330 LPRINTTAB(10)O$(X)
340 LPRINTCHR$(10)TAB(5)"method:"
350 LPRINTTAB(10)M$(X)
360 LPRINTCHR$(10)TAB(5)"success criter
  ia:"
370 LPRINTTAB(10)C$(X)
380 LPRINTCHR$(10) CHR$(10)
390 IFX/5=INT(X/5)LPRINTCHR$(12)
400 NEXT
500 CLS
510 PRINT"you may enter as many as 5 st
  udents at one time.":PRINT"     (just
   enter to print IEP's already entered
  )":PRINT
515 FORX=1TO5
520 PRINT:PRINT"enter name of student n
  umber ";X;:INPUTS$(X)
525 IFS$(X)=""GOTO2000
530 PRINT"you may enter as many as 5 go
  als per student.":PRINT
540 INPUT"enter goal #1 - ";H(X):IFH(X)
  =0:J(X)=0:K(X)=0:L(X)=0:I(X)=0:GOTO59
  0
550 INPUT"enter goal #2 - ";I(X):IFI(X)
  =0:J(X)=0:K(X)=0:L(X)=0:GOTO590
560 INPUT"enter goal #3 - ";J(X):IFJ(X)
  =0:K(X)=0:L(X)=0:GOTO590
570 INPUT"enter goal #4 - ";K(X):IFK(X)
  =0:L(X)=0:GOTO590
580 INPUT"enter goal #5 - ";L(X)
590 PRINT:PRINT"all correct (y/n)?"
600 A$=INKEY$
610 IFA$="y":A$="":GOTO1000
620 IFA$="n":CLS:A$="":GOTO520
630 GOTO600
1000 CLS:NEXT
2000 LPRINTCHR$(27)CHR$(69)CHR$(10)CHR$
  (10)
2010 PRINT"enter when the printer is re
  ady":INPUTW
2020 CLS
2030 FORX=1TO5
2040 IFS$(X)=""GOTO3000
2050 CLS:PRINT"now printing student num
  ber ";X
2060 LPRINTCHR$(14)TAB(4)"I.E.P. INSTRU
  CTIONAL OBJECTIVES"
2070 LPRINTCHR$(10)"STUDENT - ";S$(X);T
  AB(50)BD$;" TO ";ED$
```

```
2080 LPRINTCHR$(10)"IEP IMPLEMENTER - "
  ;IM$;"     TITLE - ";IT$
2100 LPRINT"**************************
  **********************"
2110 LPRINTCHR$(27)CHR$(70);CHR$(15)"ST
  UDENT RATING SCALE- "
2120 LPRINTCHR$(10)"A = Accomplished
              U = Unsatisfactory progre
  ss"
2130 LPRINT"S = Satisfactory progress
       U1 = Lack of motivation"
2140 LPRINT"M = Minimal progress
       U2 = Frequent absence
2150 LPRINT"
       U3 = Inappropriate behavior"
2160 LPRINT"
       U4 = Goal found to be inappropr
  iate"
2170 LPRINTCHR$(18)CHR$(27)CHR$(69)CHR$
  (10)"******************************
  ****************"
2180 LPRINTCHR$(10)
2190 FORY=1TO5
2200 IFY=1N=H(X)
2210 IFY=2N=I(X)
2220 IFY=3N=J(X)
2230 IFY=4N=K(X)
2240 IFY=5N=L(X)
2245 IFN=0GOTO2300
2250 LPRINTCHR$(14)Y;" ";CHR$(20);G$(N)
2260 LPRINT"Short-term: ";O$(N)
2270 LPRINT"    Method: ";M$(N)
2280 LPRINT"  Criteria: ";C$(N)
2285 LPRINT"Evaluation date-
          evaluation results-"
2290 LPRINTCHR$(10)
2300 NEXTY
3000 LPRINTCHR$(12):NEXT
4000 CLS:PRINT"Do you wish to enter mor
  e students?"
4010 PRINT:PRINT"1- more students"
4020 PRINT"2- more students/change impl
  ementer and date
4030 PRINT"3- done"
4040 A$="":A$=INKEY$
4050 IFA$="1"GOTO500
4060 IFA$="2"GOTO110
4070 IFA$="3"END
4080 GOTO4040
8000 REM ##### DATA ######
```

Figure 1

```
        I.E.P.  INSTRUCTIONAL OBJECTIVES

STUDENT - Jean E. Smyth                          3/30/81 TO 4/16/81

IEP IMPLEMENTER - L. Krengel      TITLE - Teacher
**************************************************
STUDENT RATING SCALE-

A = Accomplished              U = Unsatisfactory progress
S = Satisfactory progress       U1 = Lack of motivation
M = Minimal progress            U2 = Frequent absence
                                U3 = Inappropriate behavior
                                U4 = Goal found to be inappropriate

**************************************************


  1     To develop better addition skills.
Short-term: Student will learn to carry when adding long columns of numbers.
    Method: Teacher produced worksheets.
  Criteria: 90% success
Evaluation date-                    evaluation results-


  2     To develop an understanding of the bianary system.
Short-term: Student will learn to count to 16 in the bianary system.
    Method: TRS-80 computer exercise.
  Criteria: Two consecutive "smile faces" at the conclusion of the program.
Evaluation date-                    evaluation results-
```

Birth of a legend.

Epson.

A whole new generation of Epson MX printers has just arrived. And while they share the family traits that made Epson famous — like unequalled reliability and ultra-fine printing — they've got a lot more of what it takes to be a legend.

For instance, they've got a few extra type styles. Sixty-six, to be exact, including italics, a handy subscript and superscript for scientific notation, and enough international symbols to print most Western languages.

What's more, on the new-generation MX-80, MX-80 F/T and MX-100, you get GRAFTRAX-Plus dot addressable graphics. Standard. So now you can have precision to rival plotters in a reliable Epson printer. Not to mention true backspace, software printer reset, and programmable form length, horizontal tab and right margin.

All in all, they've got the features that make them destined for stardom. But the best part is that beneath this software bonanza beats the

Uh...three legends.

heart of an Epson. So you still get a bidirectional, logical seeking, disposable print head, crisp, clean, correspondence quality printing, and the kind of reliability that has made Epson the best-selling printers in the world.

All of which should come as no surprise, especially when you look at the family tree. After all, Epson *invented* digital printers almost seventeen years ago for the 1964 Tokyo Olympics. We were the first to make printers as reliable as the family stereo. And we introduced the computer world to correspondence quality printing and disposable print heads. And now we've given birth to the finest printers for small computers on the market.

What's next? Wait and see. We're already expecting.

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FEATURE	ORIGINAL MX-80	GRAFTRAX-80*	ORIGINAL MX-100	MX-80 with GRAFTRAX-Plus	MX-80 F/T with GRAFTRAX-Plus	MX-100 with GRAFTRAX-Plus
Bidirectional printing	X	X	X	X	X	X
Logical seeking function	X	X	X	X	X	X
Disposable print head	X	X	X	X	X	X
Speed: 80 CPS	X	X	X	X	X	X
Matrix: 9 x 9	X	X	X	X	X	X
Selectable paper feed			X		X	X
PAPER HANDLING FUNCTIONS						
Line spacing to n/216		X		X	X	X
Programmable form length	X	X	X	X	X	X
Programmable horizontal tabs	X	X	X	X	X	X
Skip over perforation			X	X	X	X
PRINT MODES AND CHARACTER FONTS						
96 ASCII characters	X	X	X	X	X	X
Italics character font		X		X	X	X
Special international symbols				X	X	X
Normal, Emphasized, Double-Strike and Double/Emphasized print modes	X	X	X	X	X	X
Subscript/Superscript print mode				X	X	X
Underline mode				X	X	X
10 CPI	X	X	X	X	X	X
5 CPI	X	X	X	X	X	X
17.16 CPI	X	X	X	X	X	X
8.58 CPI	X	X	X	X	X	X
DOT GRAPHICS MODE						
Line drawing graphics				X	X	X
Bit image 60 D.P.I.		X	X	X	X	X
Bit image 120 D.P.I.		X	X	X	X	X
CONTROL FUNCTIONS						
Software printer reset		X		X	X	X
Adjustable right margin			X	X	X	X
True back space		X		X	X	X
INTERFACES						
Standard — Centronics-style 8-bit parallel	X	X	X	X	X	X
Optional — RS-232C current loop w/2K buffer	X	X	X	X	X	X
RS-232C x-on/x-off w/2K buffer	X	X	X	X	X	X
IEEE-488	X	X	X	X	X	X

*Tandy TRS-80 block graphics only available with GRAFTRAX 80.

Color Computer gradebook

Maintain a record of grades and compute report card averages

Color Computer with Extended BASIC, 16K and cassette

Lynn H. Davis, Clay, NY

It's not that I dislike doing report card averages — heaven knows how important they are. The problem is that they take me so . . . much . . . time. Add to that the boredom involved in doing the same mathematical calculations over and over again (once for each of my students), and you get an idea of why my stomach used to do a flip-flop everytime I found blank report card forms in my school mailbox.

Electronic Technology

Fortunately, electronic technology has reduced the time and drudgery involved in coming up with a student's grade. When I started teaching ten years ago, we had two methods available to calculate report card averages. One way was to use pencil and paper. I remember it taking me (on and off), about a week to do all of the necessary addition and division.

The second method available to teachers was the school's adding machine. It was a big, green, electrical monster that printed out a student's grade average on adding machine tape, and gave a "remainder" when it divided, rather than the decimal equivalent. I fondly remember that the machine added numbers relatively quickly, but when you hit the divide key, the monster made all kinds of funny noises and took from 5 to 10 seconds before it could come up with the answer.

The adding machine was faster and more accurate than pencil and paper. Since it couldn't leave the school, teachers would race each other to the faculty room to be the first in line to use it. With the adding machine, I needed about four days to do my report card averages.

A few years later, hand-held calculators hit the market. For $75.00, I got one that performed six functions (!) as fast as you could press the keys. At the time, the calculator was the marvel of technology. With it, I could do my report card grades at home in about six hours.

Two years ago, I bought one of those programmable calculators. The little beauty has 40 keys, and performs 70 functions. It also has ten memories and will accept a 32-keystroke "formula" — all for $25.99. With this calculator, report card time was reduced to a five-hour stretch.

Then I brought home my TRS-80 Color Computer. With 16K, Extended BASIC, a cassette, and the Line Printer VII, I was once again ready to cut down the time involved for one of my "favorite" activities. Almost before the computer was out of the box, I was searching the software for a report card grade calculation program.

Problems

It didn't take me long to realize that the available programs (for Model I and III) were not what I was looking for. First of all, some of the programs required setting up files on cassette tape. If you're looking for speed, this is definitely not the place to find it. Besides, I knew that eventually I would end up recording new grades on top of old files, and really end up with a mess.

The second problem I found was that some software programs required the user to assign a "weight" (usually in terms of a percent) to every single grade given to a student. While most teachers know how much they want homework assignments, laboratory experiments, quizzes and tests to count, they don't want to sit down with a calculator and figure the weight of each grade to the nearest hundredth of a percent. This is, after all, what we have the computer for.

The third problem, and by far the most important, was that some of the programs assumed that every student did the same number of assignments. With the individualization that goes on in today's classroom, some kids end the marking period with fewer required assignments. Add to that, the fact that some kids are absent, and don't get in all their back work until after

report cards are handed in, and it becomes evident that a program must be able to take into account a variable number of grades.

I should also point out how the second and third problems react with each other. If you have a program that allows a variable number of grades, and also one in which every grade must be assigned a weight, the weight of each grade must be input *for each individual student.* For example, if student A has 10 assignments (and assuming the teacher wants to weigh each grade equally), each grade would be assigned a weight of 10 percent. But if student B only had to do nine assignments, the teacher has to input a weight of 11.11 percent for each grade.

The example above assumes that a teacher wants each grade to count equally. If different grades were to be assigned different weights, and different kids did different assignments, a teacher would then be locked into calculating different percentage weights for each student. It would be just as easy to forget about the weights and run all the grades right through the calculator.

The Decision

With no software available that performed exactly as I wanted, I decided I would have to make my own. After some careful thought, I decided that the program should incorporate the following parameters:

(1) The program must be fast and easy to operate, using the hardware that I now have.

(2) The student names and grades should be part of the program, incorporated into DATA statements. DATA statements were chosen because I don't have a disk drive, and cassette files are just too slow.

(3) The program must allow for a number of different categories of grades (i.e., homework, labs, reports, quizzes, tests, etc.)

(4) The program must be flexible enough to allow for a weighting of grades, but not so inflexible that the weighting has to be calculated for every single grade.

(5) The program must allow for a variable number of grades per category for each student.

(6) The averages should show on the CRT *and* dump to the printer.

(7) Not only should the program be used to calculate individual marking period averages, but it should also serve as a vehicle to store those marking period grades until the end of the year. In that way, they can be used, with input of the final exam grade, to calculate the students final average.

(8) The student grades must be easy to update.

The Program

With the above parameters in mind, the program I've designed is shown in the listing. The program is relatively straightforward with a number of REMarks to help you follow the flow. There are several important sections of the program that need to be discussed, as they directly control the end product.

The first thing you should notice are the DATA statements (the names and grades are fictitious in order to protect the innocent). There are two DATA lines for each student and they may look like the following

example.

```
3000 DATA ANDERSON,80,90,83,1,1,74,85,1,92,1

3005 DATA 70,80,85
```

The DATA statement line numbers that end in zero contain the student's name and current grades for the marking period. The number 1 is a flag to the computer that separates one category of grades (with a certain weight) from another category of grades.

In this particular example, student Anderson has completed three homework assignments (grades of 80, 90 and 83), not yet completed his project (and thus no grade between the 1s), two lab experiment grades, and one test grade.

The second DATA statement (or the ones ending in five) contains student Anderson's averages for the previous three marking periods. The marking period grades in line 3000 will be used to calculate the fourth marking period average.

You can actually have from one to ten different categories of grades in line 3000 (a category being such things as homework assignments, quizzes, laboratory experiments, projects, tests, independent study, extra credit, etc.). The only drawback is that every student must have the same number of categories of grades in his DATA line (in other words, each line must have the same number of 1s). The saving grace is that you do not have to record marks into each category.

In the example using student Anderson, he hasn't done the project yet, so there is no grade recorded in that category. Lines 1020 - 1040 take care of the percentage weights assigned to categories where there is no grade yet.

If the empty category is anywhere on the DATA line, except in the last position, line 1020 recognizes that fact and automatically assigns that empty category weight to the next used category. In that way, student Anderson is not penalized because he didn't need to hand in his project yet. The percentage weight assigned originally to the project is just added to the next category (in this case the lab grades).

If the last category is empty of grades, then lines 1030 and 1040 automatically add that percentage weight into the students total grade up to that point. This, again, does not penalize the student.

On the other hand, if student Anderson fails to complete his project by the prescribed date, then I would put a grade of zero between those 1s. The computer would read the zero, and multiply it by the percentage weight. This would penalize student Anderson as he may end up with, say, 20 percent of his grade based on a zero.

Lines 390 - 480 control the input of weights for each category, and line 2230 reminds me what each category is, and the order that they are in. If you know that certain categories may have no grades in them, care should be taken in their alignment so that the weight of an unused category is added to the category you desire.

Why Two DATA Lines?

There are two DATA lines for each student, to save me some additional time. At the beginning of each new marking period, all I will have to do is some quick EDITing to get started. I'll HACK away all of the old grades, and put in any new marks for the next marking period. I will then EDIT line 3005 by EXTENDING it to include the fourth marking period average.

If both sets of grades were on the same line, the EDITing would be more time consuming, because I would have to take care to DELETE only classwork grades, and not marking period averages.

Modifications

As the program is written, you can have from zero to 25 marks in each category of grades. This is controlled by line 990, and this upper limit can be changed to any number you wish. I used 25, because I doubt that I will ever have more than 25 grades in any one category.

If you have less (or more) than six marking periods in your school year, you will have to make the necessary modifications in lines 1370 - 1460 (which read the appropriate number of marking period averages). You would also have to modify the GOSUB in line 1180 which reads the six marking period averages at the end of the year.

If you have other than six marking periods, line 1200 would need to be changed to add together the appropriate number of marking periods and divide them by that number. You would also need to modify the PRINT#-2 statements in lines 790, 800, 1560-1620, 1670 and 1780.

Line 1270 calculates the student's final average and is based on two-thirds of his marking period average (I) and one-third of his final exam score (L). This line would need to be changed if your school uses a different formula to calculate a final average.

The End Result

In addition to the display on the CRT, there are two types of printouts that result from this program. Figure 1, is a typical printout showing the current marking period averages for each student. Next to that grade, is a space for any comments you may wish to make regarding that student or his grade (absent, incomplete work, etc.). The student's previous marking period averages are also shown so that you can note any progress (or lack of progress) the student is making.

The second printout, Figure 2, will be used only at the end of the year. You see the student's name, his six marking period averages, his final exam score (which must be input), and his final average.

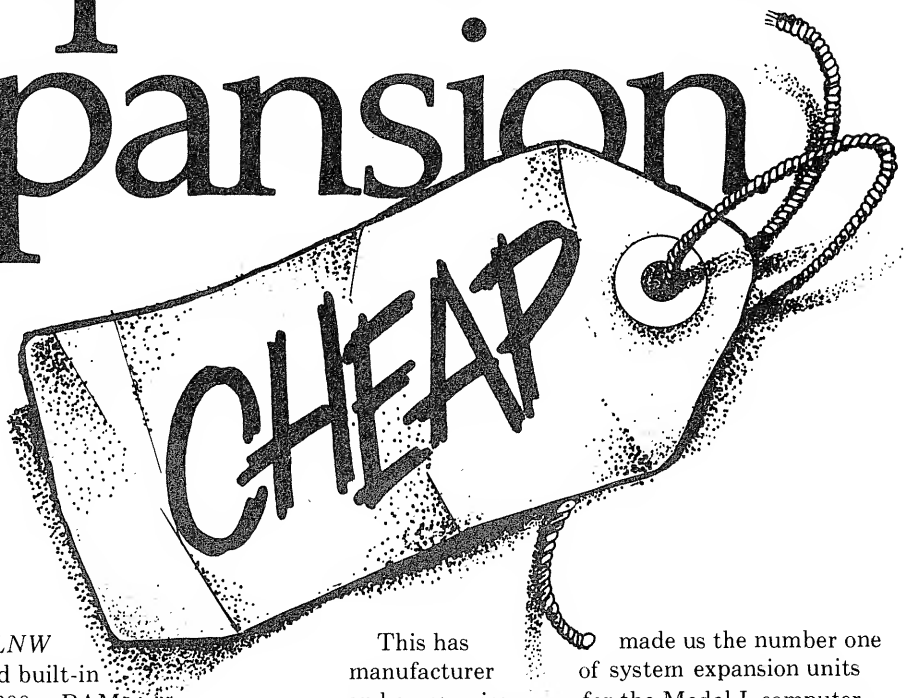
The display on the CRT shows the student's name and average, and if the student's grade is below 65 percent (a failing grade in my district), his grade is underlined in red and a sound is generated by the computer to call your attention to it. Lines 1500, 1520, 1640 and 1670 control these features and can be modified to fit your own particular situation.

The Highlights

This program offers several nice features that make using it very convenient.

(1) It uses a weighted grade feature, but the weights

Expensive Expansion



EXPENSIVE – The *LNW System Expansion II* and built-in comes with a full 32K of 200ns RAM; RS232c 20 MA current loop serial interface. That's for starters. Next, consider our heavy gauge steel case, power indicator lamp, gold-plated connectors, FR-2 glass epoxy circuit board with solder mask and silk screen legends. Then there is the parallel printer port, screen printer port, real time clock, and extra heavy duty onboard power supply with over current protection, over voltage protection and thermal shutdown. If that's not enough then there is the floppy disk controller, guaranteed operation at a 4MHz CPU speed and our 6 month warranty. Every one of these features is *STANDARD*. This is true system expansion. You get every 'expensive' feature without spending more.

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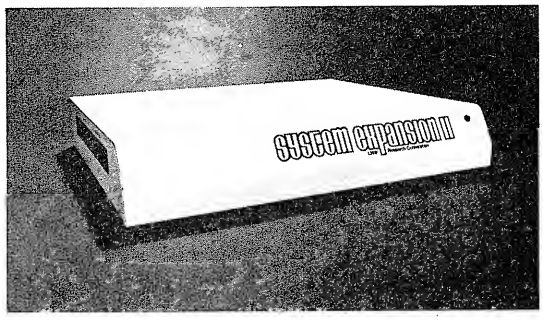

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*8" drive operation requires special cable, 8" double-density requires 3.55MHz CPU speed-up modification or LNW-80 4MHz computer.

are by categories of grades rather than individual grades.

(2) You can have any number of grades per category (you can even have no grades in a category).

(3) There is no waiting for the cassette to load in files, as all of the students and their grades are part of the program.

(4) I use one cassette tape per class. All I have to do is load the program, EDIT the DATA statements, run the program for a current update and print out, and then CSAVE the program for the next update.

(5) It is very easy to modify the grades in the DATA statements. Extended BASIC gives us an EDIT command, and with it we can DELETE, INSERT, CHANGE, SEARCH and HACK very rapidly.

(6) There is plenty of memory space available for the usual number of kids in a class. The program, as shown in the listing (even with all the REMarks and the 15 students), will load into the computer without needing a PCLEAR 1 or POKE 25,6:NEW direct command. The PCLEAR 1 command is built into the program (lines 150 and 2170 - 2200) in case you need it. If you have a lot of DATA, you may have to give the computer a direct command before loading the tape.

(7) The program will calculate student marking period averages on a minimum of one grade. This is a desirable feature because I can get a printout of averages everytime I update the grades. This, in turn, will allow me to easily monitor all student grades, and will tell me almost immediately if a student is headed into academic trouble.

How Fast Is It?

I know you're all wondering how much time it takes me to do my grades, now that they are "computerized." I usually update student grades four to five times per marking period, and it takes me around 50 minutes to EDIT in the new grades each time.

My total time is now down to about four hours. That time, however, is divided up over the six-week marking period, which to me means no "plop plop — fizz fizz" when I find those blank report cards hiding in my mailbox.

Program Listing for Gradebook

```
10 REM ****************************
20 REM
30 REM    REPORT CARD AVERAGES
40 REM
50 REM    BY: MR. LYNN H. DAVIS
60 REM        4316 AMBLEWOOD LANE
70 REM        CLAY, N.Y. 13041
80 REM
90 REM    TRS-80 COLOR COMPUTER
100 REM    16K EXTENDED BASIC
110 REM    LINE PRINTER VII
120 REM    CASSETTE TAPE RECORDER
130 REM
140 REM ****************************
150 GOTO 2170
160 GOSUB 1850
170 CLS
180 PRINT:PRINT" THIS PROGRAM CALCULATE
S THE"
190 PRINT"INDIVIDUAL MARKING PERIOD"
200 PRINT"AVERAGES FOR STUDENTS, AND IS
"
210 PRINT"BASED ON A WEIGHTED VARIABLE
   SYSTEM."
220 PRINT:PRINT" YOU WILL BE ABLE TO SE
E THE"
230 PRINT"STUDENT NAMES AND AVERAGES"
240 PRINT"SHOW ON THE SCREEN AND/OR PRI
NT"
250 PRINT"OUT ON A PRINTER."
260 PRINT:INPUT"PRESS <ENTER> TO CONTIN
UE";Z$
270 CLS
280 PRINT:PRINT" WHICH WOULD YOU PREFER
:"
290 PRINT"    1. SHOW AVERAGE ON SCREEN.
"
300 PRINT"    2. PRINT OUT OF AVERAGES."
310 PRINT"    3. INPUT OF FINAL EXAM TO"
320 PRINT"       CALCULATE FINAL AVERAGE
-"
330 PRINT"       WITH PRINT OUT."
340 PRINT:PRINT
350 PRINT"TYPE IN THE NUMBER OF YOUR"
360 INPUT"CHOICE AND PRESS <ENTER>";W
370 IF W<1 OR W>3 THEN 270
380 CLS:TB=0
390 PRINT:PRINT"HOW MANY DIFFERENT cate
gories"
400 PRINT"OF GRADES ARE ON THE FIRST DA
TA"
410 INPUT"LINE <1 TO 10>";DG:IF DG<1 OR
 DG>10 THEN 380:IF W=3 THEN 490
420 PRINT:PRINT"WHAT IS THE WEIGHT OF E
ACH TYPE OF GRADE?"
430 FOR T=1 TO DG
440 INPUT D(T)
450 NEXT T
460 REM CHECK WEIGHTS TO MAKE SURE THEY
 EQUAL 100
470 FOR T=1 TO DG:TB=D(T)+TB:NEXT T
480 IF TB<>100 THEN TB=0:CLS:PRINT"WEIG
HTS DO NOT EQUAL 100":GOTO 420
490 CLS
500 PRINT@192,"HOW MANY MARKING PERIOD
GRADES"
510 INPUT"ARE THERE ON FILE <0 TO 6>";B
1
520 IF B1<0 OR B1>6 THEN 490
530 IF W=3 AND B1<>6 THEN 540 ELSE 580
540 PRINT@32,"YOU MUST HAVE 6 MARKING P
ERIOD"
```

```
550 PRINT"GRADES ON FILE TO CALCULATE T
HE"
560 PRINT"FINAL GRADE."
570 GOTO 500
580 IF W=1 THEN 820
590 CLS
600 PRINT@229,"WHAT IS TODAYS DATE?"
610 LINEINPUT "      ";K$
620 CLS
630 REM CHECK STATUS OF PRINTER
640 Z=PEEK(65314)
650 IF Z=4 OR Z=6 THEN PRINT@160,"I SEE
 THAT YOUR PRINTER IS ON" ELSE 670
660 PRINT"LINE. PLEASE ALIGN THE PAPER.
"
670 IF Z=5 OR Z=7 THEN PRINT@160,"PLEAS
E TURN ON YOUR PRINTER" ELSE 690
680 PRINT"AND ALIGN THE PAPER."
690 PRINT:PRINT
700 INPUT"PRESS <ENTER> WHEN READY";Z$
710 CLS: PRINT@228,"printing heading on
 paper"
720 REM PRINT HEADING ON PAPER
730 PRINT#-2,CHR$(31);"C.J.H.S."
740 PRINT#-2,CHR$(30);"MR. L. DAVIS"
750 PRINT#-2,"6th PERIOD"
760 PRINT#-2,"STUDENT AVERAGES"
770 PRINT#-2,"UPDATE: "K$
780 FOR S=1 TO 2:PRINT#-2,CHR$(10):NEXT
 S
790 IF W=2 THEN PRINT#-2, "STUDENT
    AVERAGE       COMMENTS        MP1    M
P2    MP3    MP4    MP5    MP6"
800 IF W=3 THEN PRINT#-2,"STUDENT
       MP1    MP2    MP3    MP4    MP5    MP
6    EXAM   FINAL AVE."
810 PRINT#-2,CHR$(10);
820 J1=1:L=0:L1=0:P=0:P1=0:HA=0
830 CLS
840 REM PLACES BORDER ON THE SCREEN
850 FOR Y=1 TO 10:PRINT@95+Y,C$;:PRINT@
117+Y,C$;:PRINT@383+Y,C$;:PRINT@405+Y,C
$;
860 NEXT Y
870 FOR Y=1 TO 14:PRINT@72+Y,C$;:PRINT@
424+Y,C$;:NEXT Y
880 PRINT@128,C$;:PRINT@159,C$;
890 PRINT@352,C$;:PRINT@383,C$;
900 REM GRADE CALCULATIONS
910 C=1:C1=0:H=0:HT=0:X=0:HA=0:T1=0:G=0
:T2=0:T4=0
920 REM READ THE STUDENT NAME
930 READ N$
940 IF N$="END" THEN 1700
950 REM COUNT THEN NUMBER OF STUDENTS
960 J=J1+J
970 REM READ THE GRADES FOR THE CURRENT
 MARKING PERIOD AND CALCULATE THE AVE.
```

```
980 FOR A=1 TO DG
990 FOR X=1 TO 25
1000 READ H
1010 REM REARRANGE THE WEIGHTS IF A STU
DENT HAS NO GRADES IN A CERTAIN CATEGOR
Y
1020 IF H=1 AND C1=0 AND A<>DG THEN Q=D
(A)+Q:ZA=1:GOTO 1060
1030 IF H=1 AND C1=0 AND A=DG AND ZA=1
THEN HA=(T3*(D(DG)+Q))/100:GOTO 1140

1040 IF H=1 AND C1=0 AND A=DG THEN HA=(
T3*D(DG))/100:GOTO 1140
1050 IF ZA<>1 THEN Q=D(A)
1060 IF H=1 AND C1=0 THEN NEXT A
1070 IF H=1 THEN 1110
1080 HT=H+HT:REM ADD THE GRADES TOGETHE
R IN ONE CATEGORY
1090 C1=C+C1:REM TOTAL OF THE NUMBER OF
 GRADES IN A CATEGORY
1100 NEXT X
1110 IF ZA=1 THEN Q=D(A)+Q
1120 T1=0:T1=HT/C1:T2=T1+T2:T4=T4+1:T3=
T2/T4:REM AVE. GRADE/CATEGORY,TOTAL & A
VE
1130 HA=(T1*Q)/100:REM MULTIPLY THE AVE
RAGE BY THE PERCENTAGE WEIGHT
1140 G=HA+G:REM ADD TOGETHER THE AVERAG
ES IN EACH CATEGORY FOR MARKING PD. AVE

1150 HT=0:C1=0:ZA=0:Q=0
1160 NEXT A
1170 REM READ THE 6 MARKING PERIOD GRAD
ES IF NEEDED
1180 IF W=3 THEN GOSUB 1460 ELSE GOTO 1
310
1190 REM ADD THE 6 MARKING PERIOD GRADE
S TOGETHER
1200 I=(M1+M2+M3+M4+M5+M6)/6
1210 PRINT@192,"  STUDENT: ";N$
1220 PRINT@224,"  FINAL EXAM GRADE.....
.";
1230 INPUT L
1240 REM TOTAL ALL FINAL EXAM GRADES
1250 L1=L+L1
1260 REM CALCULATE THE STUDENTS FINAL A
VERAGE FOR THE YEAR
1270 P=(I+I+L)/3
1280 REM ADD TOGETHER ALL THE FINAL AVE
RAGES
1290 P1=P+P1
1300 GOTO 1620
1310 REM SOUND FOR A FAILING GRADE
1320 IF G<65 THEN FOR Y=150 TO 100 STEP
-5:SOUND Y,1:NEXT Y
1330 REM ADD ALL THE MARKING PERIOD GRA
DES TOGETHER
1340 G1=G+G1
1350 REM CALCULATE THE CLASS MARKING PE
RIOD AVERAGE
1360 B=G1/J
1370 IF B1=0 THEN 1480
1380 REM IF MENU CHOICE WAS 1 OR 2 THEN
 READ THE RIGHT MARKING PERIOD AVERAGES
1390 IF W<>3 THEN ON B1 GOSUB 1410,1420
,1430,1440,1450,1460
1400 GOTO 1480
1410 READ M1:RETURN
1420 READ M1,M2:RETURN
1430 READ M1,M2,M3:RETURN
1440 READ M1,M2,M3,M4:RETURN
1450 READ M1,M2,M3,M4,M5:RETURN
1460 READ M1,M2,M3,M4,M5,M6:RETURN
1470 REM PRINT ROUTINES
1480 IF W<>3 THEN PRINT@197,"student
     grade"
1490 REM UNDERLINE A FAILING GRADE IN R
ED
1500 IF G<65 AND W=2 THEN FOR Y=1 TO 5:
PRINT@278+Y,CHR$(143+48);:NEXT Y
1510 PRINT@229, USING V3$;J,Q$,N$,G
1520 IF G<65 AND W=1 THEN FOR Y=1 TO 5:
PRINT@278+Y,CHR$(143+48);:NEXT Y
1530 IF W=2 AND B1=0 THEN PRINT#-2, USI
NG V4$; J,Q$,N$,G,F$:GOTO 1620
1540 IF W=2 THEN ON B1 GOSUB 1560,1570,
1580,1590,1600,1610
1550 GOTO 1620
1560 PRINT#-2,USINGV1$;J,Q$,N$,G,F$,M1:
RETURN
1570 PRINT#-2,USINGV1$+V2$;J,Q$,N$,G,F$
,M1,M2:RETURN
1580 PRINT#-2,USINGV1$+V2$+V2$;J,Q$,N$,
G,F$,M1,M2,M3:RETURN
1590 PRINT#-2,USINGV1$+V2$+V2$+V2$;J,Q$
,N$,G,F$,M1,M2,M3,M4:RETURN
1600 PRINT#-2,USINGV1$+V2$+V2$+V2$+V2$;
J,Q$,N$,G,F$,M1,M2,M3,M4,M5:RETURN
1610 PRINT#-2,USINGV1$+V2$+V2$+V2$+V2$+
V2$;J,Q$,N$,G,F$,M1,M2,M3,M4,M5,M6:RETU
RN
1620 IF W=3 THEN 1630 ELSE 1680
1630 PRINT@192,"STUDENT          EXAM  F
INAL AVE."
1640 IF P<65 THEN FOR Y=1 TO 9:PRINT@27
7+Y,CHR$(143+48):NEXT Y
1650 PRINT@224, USING"##%%%          %#
##      ###";J,Q$,N$,L,P
1660 IF P<65 THEN FOR Y=150 TO 100 STEP
-5:SOUND Y,1:NEXT Y
1670 PRINT#-2,USING V7$;J,Q$,N$,M1,M2,M
3,M4,M5,M6,L,P
1680 PRINT:IF W=1 THEN INPUT "  PRESS <
ENTER> TO CONTINUE";Z$
1690 GOTO 910
1700 CLS
```

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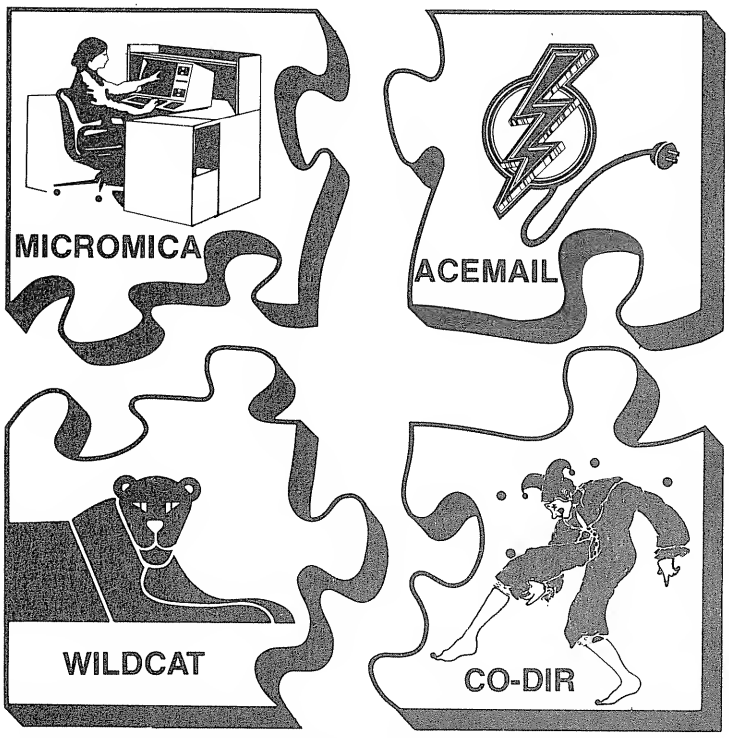

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```
1710 IF W<>3 THEN PRINT@231,USING"%
        %##.#%";R$,B
1720 IF W=2 THEN PRINT#-2,"---------
----------"
1730 IF W=2 THEN PRINT#-2,USING"%
      %    ##.#%";R$,B
1740 IF W=3 THEN 1750 ELSE 1790
1750 PRINT@196,USINGV5$;"FINAL EXAM AVE
RAGE =",L1/J
1760 PRINT@228,USINGV5$;"     FINAL AVE
RAGE =",P1/J
1770 PRINT#-2,V8$
1780 PRINT#-2,USING V6$;"class averages
",L1/J,P1/J
1790 PRINT@289,"RUN PROGRAM AGAIN <Y OR
 N>";
1800 INPUT U$
1810 G1=0:J=0
1820 IF U$="Y" OR U$="YES" THEN RESTORE
:GOTO 270
1830 END
1840 REM  INTRODUCTION
1850 CLS(0):FOR Y=1 TO 500:NEXT Y
1860 FOR K=1024 TO 1535
1870 N=RND(128)+127
1880 POKE K,N
1890 IF N>200 AND N<245 THEN SOUND N,1
ELSE 1900
1900 NEXT K
1910 FOR Y=1 TO 1000:NEXT Y
1920 PRINT@170,"              ";
1930 PRINT@202,"   COLOR      ";
1940 PRINT@234,"  COMPUTER    ";
1950 PRINT@266," GRADEBOOK    ";
1960 PRINT@298,"              ";
1970 FOR Y=1 TO 2000:NEXT Y
1980 PRINT@202," BY:          ";
1990 PRINT@234,"              ";
2000 PRINT@266," LYNN DAVIS   ";
2010 FOR Y=1 TO 2000:NEXT Y
2020 Y=0
2030 REM  PRINT ROUTINES
2040 C$=CHR$(143+32)
2050 R$="class average ="
2060 Q$="."
2070 F$="      ............"
2080 V1$="##%%%            %###%
         %   ###"
2090 V2$="   ###"
2100 V3$="##%%%             %###"
2110 V4$="##%%%            %###%
         %"
2120 V5$="%                 % ###%"
2130 V6$="%                    %
                           ###%    ###%
"
2140 V7$="##%%%              %###   ###
   ###   ###   ###   ###   ###     ###"
2150 V8$="-----------------
                                ----    ----
"
2160 RETURN
2170 GOTO 2190
2180 GOTO 160
2190 PCLEAR 1
2200 GOTO 2180
2210 REM DATA STATEMENTS HAVE A 1 TO LO
CATE THE END OF EACH category OF GRADE.
2220 REM SECOND SET OF DATA STATEMENTS
NEEDED AFTER 1ST MARKING PERIOD.
2230 REM HOMEWORKS, FLAG, PROJECT, FLAG
, LABS, FLAG, TESTS, FLAG
3000 DATA ARMSTRONG,80,82,86,75,1,81,1,
78,84,1,80,80,1
3005 DATA 70,80,85
3010 DATA BRADFORD,1,60,1,55,69,45,1,52
,58,1
3015 DATA 74,68,60
3020 DATA CARDWELL,89,87,80,1,1,87,93,9
1,1,86,1
3025 DATA 95,82,87
3030 DATA FERGERSON,70,78,82,1,73,81,75
,1,1,80,76,1
3035 DATA 83,65,73
3040 DATA FLEMING,87,84,91,88,1,88,1,90
,1,1
3045 DATA 86,90,83
3050 DATA GOODWIN,1,1,52,65,59,1,70,61,
54,1
3055 DATA 65,50,53
3060 DATA HIGGINS,1,80,70,1,1,72,74,78,
1
3065 DATA 74,65,71
3070 DATA KING,1,81,74,1,83,84,75,79,1,
1
3075 DATA 82,72,77
3080 DATA LAWRENCE,84,85,90,81,83,1,1,1
,83,90,82,1
3085 DATA 87,88,91
3090 DATA LITTLEFIELD,85,88,83,86,1,1,8
0,92,87,83,92,1,1
3095 DATA 81,85,92
3100 DATA MAURER,54,60,67,58,72,51,1,56
,62,1,1,1
3105 DATA 75,66,60
3110 DATA RODGERS,1,1,1,95,93,96,100,1
3115 DATA 90,92,95
3120 DATA SHARPE,1,1,90,100,100,84,81,1
,1
3125 DATA 92,85,91
3130 DATA STEDMANN,1,84,89,92,84,1,1,1
3135 DATA 94,82,88
3140 DATA VINCENT,90,93,87,60,85,90,93,
1,1,1,1
3145 DATA 93,88,90
3150 DATA END
```

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C. J. H. S.
MR. L. DAVIS
6th PERIOD
STUDENT AVERAGES
UPDATE: 2/20/82

STUDENT	AVERAGE	COMMENTS	MP1	MP2	MP3	MP4	MP5	MP6
1. ARMSTRONG	81	.....	70	80	85			
2. BRADFORD	57	.....	74	68	60			
3. CARDWELL	88	.....	95	82	87			
4. FERGERSON	78	.....	83	65	73			
5. FLEMING	89	.....	86	90	83			
6. GOODWIN	60	.....	65	50	53			
7. HIGGINS	75	.....	74	65	71			
8. KING	79	.....	82	72	77			
9. LAWRENCE	85	.....	87	88	91			
10. LITTLEFIELD	86	.....	81	85	92			
11. MAURER	60	.....	75	66	60			
12. RODGERS	96	.....	90	92	95			
13. SHARPE	91	.....	92	85	91			
14. STEDMANN	87	.....	94	82	88			
15. VINCENT	85	.....	93	88	90			
class average =	79.7%							

Figure 1 — This is an example of the printout received when calculating marking period averages for the students shown in the program. The current average results from inputing a 10 percent weight for homework grades, 20 percent for projects, 30 percent for lab experiments and 40 percent for tests.

C. J. H. S.
MR. L. DAVIS
6th PERIOD
STUDENT AVERAGES
UPDATE: 6/22/82

STUDENT	MP1	MP2	MP3	MP4	MP5	MP6	EXAM	FINAL AVE.
1. ARMSTRONG	70	80	85	81	88	83	84	82
2. BRADFORD	74	68	60	57	65	71	58	63
3. CARDWELL	95	82	87	88	90	85	90	89
4. FERGERSON	83	65	73	78	80	82	73	76
5. FLEMING	86	90	83	89	85	90	88	87
6. GOODWIN	65	50	53	60	55	70	57	58
7. HIGGINS	74	65	71	75	78	72	80	75
8. KING	82	72	77	79	80	75	82	79
9. LAWRENCE	87	88	91	85	83	88	84	86
10. LITTLEFIELD	81	85	92	86	88	90	81	85
11. MAURER	75	66	60	60	65	70	74	69
12. RODGERS	90	92	95	96	92	96	94	94
13. SHARPE	92	85	91	91	90	93	90	90
14. STEDMANN	94	82	88	87	85	90	93	89
15. VINCENT	93	88	90	85	83	81	82	85
class averages							81%	80%

Figure 2 — This is the printout received at the end of the year. For the program to calculate a final grade, the DATA statements must contain the six marking period averages, and the final exam grade must be INPUT from the keyboard. ■

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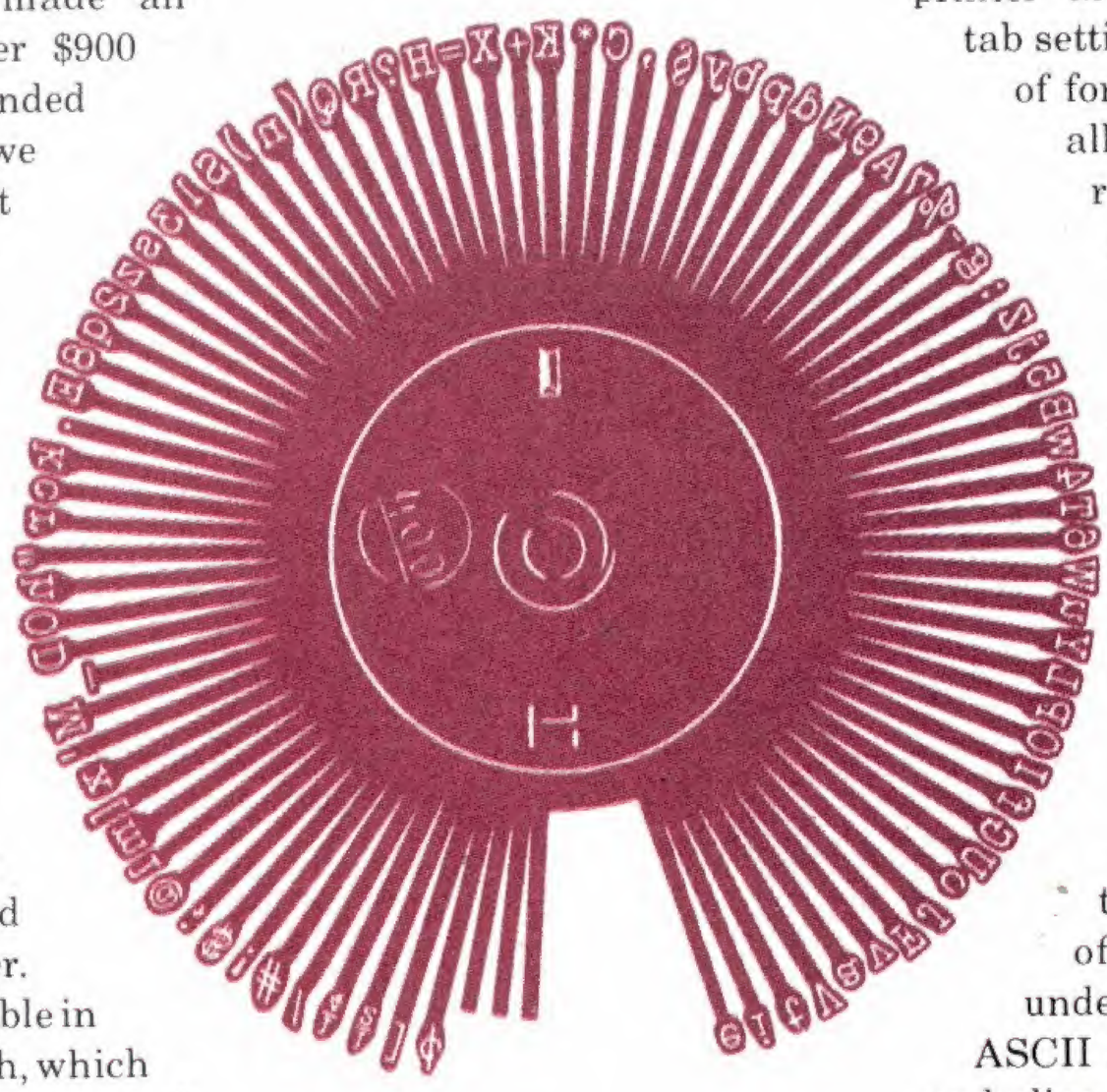
Daisywheel printer for under $900

Evaluation of the Smith-Corona daisywheel printer

Mike Schmidt, Publisher

The daisywheel printer market has been able, up to now, to hold prices at least in the neighborhood of sixteen hundred plus dollars. Recently, the Smith-Corona Company made an announcement of an under $900 daisywheel printer. This sounded too good to be true, so we ordered one and checked it out. Here is what we found.



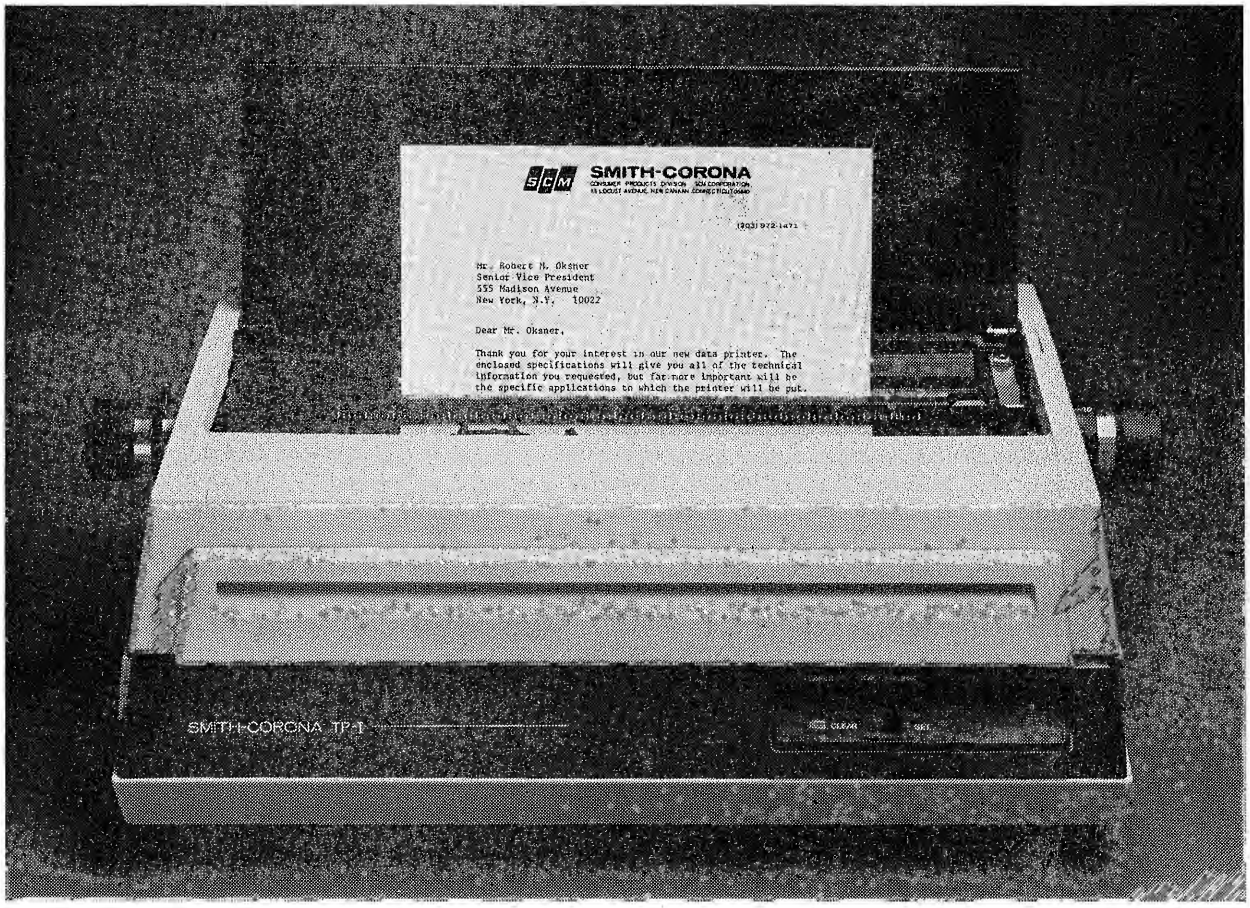
The Smith-Corona printer is designated the TP-1. It is a microprocessor controlled, fully-formed character (daisywheel) printer. It It is compatible with all of the major microcomputer systems in today's market. Although primarily designed as a high-quality word processing printer, it can also be utilized as a general purpose printer.

The TP-1 printer is available in two basic versions, a 10-pitch, which gives a 105-character line; or a 12-pitch version, which expands the printable line length to 126 characters.

There are two standard interfaces presently available for the TP-1. One is a Centronics compatible parallel interface and the other is an RS232 serial interface.

Some of the features of the TP-1 daisywheel printer are programmable margins, tab settings, auto-underline and top of form. Programmable margins allow the user to set and release margins under program control. Tabs may be set by moving the printer carriage to the desired point and sending an ASCII DC2 character. An ASCII DC4 character will remove a tab set. Auto-underline is enabled by sending an ASCII EM character (Hex 19). The EM character puts the printer into an underline mode, all characters printed following receipt of the EM character will be underlined. Receipt of another ASCII EM character will halt the underline mode and return the printer to normal. Top of form is under control of the top of form switch, located on the front panel of the printer. The operator can set top of form at any location

Smith-Corona introduces the only daisy wheel printer under $900* for your TRS-80®



You're putting together a desktop computer system for your office or home. And you want to add a letter quality printer so you can do word processing, too. But you don't want to spend a fortune.

Until now, you really had little choice but to settle for dot matrix printers. True, a dot matrix doesn't produce letter-perfect printing, but daisy wheel printers just cost too much. That is, they did.

Now, Smith-Corona® offers a daisy wheel printer at such an incredibly low price, you can't afford *not* to get it. (The fact is, you won't find a daisy wheel printer *anywhere* at a price so low.)

The Smith-Corona TP-I™ printer operates with microprocessor controlled daisy wheel technology, and is available with either standard serial or parallel data interface. It is compatible with your TRS-80. And, unlike many printers currently on the market, it's made in America.

Best of all, the TP-I produces results identical to those of our very finest office typewriters—printing with real character. So it can be used to send out letters that have to look perfect. As well as financial statements, inventory reports, direct mail campaigns, manuscripts. Even a letter to your son in college! Anything at all you need printed.

The basic TP-I will handle letter or legal sized paper. An option that will be available soon will enable it to handle either fanfold or single sheet paper.

The TP-I is easy-to-use—just turn the power on, load the paper, and away it goes. There are drop-in ribbon cassettes and a choice of easy-to-change, snap-on daisy print wheels for a variety of fonts.

So stop thinking you can't afford a daisy wheel printer. Because, thanks to Smith-Corona, a printer with real character is no longer expensive. **Smith-Corona**

Please send me more information on the Smith-Corona TP-I daisy wheel printer.

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Smith-Corona
65 Locust Avenue
New Canaan, Connecticut 06840

US80-8

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on a page. When this has been done, the printer will be sensitive to the ASCII FF (form feed) character and any time it is received by the printer, will advance the page to top of form position.

The TP-1 uses standard SCM supplies and ribbon cassettes. Only detented daisywheel elements can be used in this printer. The print quality is excellent. The print speed averages 12 characters per second.

The standard 128 ASCII character set is supported by the TP-1. The unit prints 88 of these characters, those remaining are either control characters or are ignored by the printer. From the point of view of the computerist, the most notable of the missing characters were the "greater than," "less than," "up-arrow" and a slashed zero. We discussed these essential characters with Mr. Daniel McCarthy, Vice President of Special Market Sales at SCM. He has subsequently informed us that a new print wheel with additional ASCII characters is in the works. Availability to be announced.

The printer handles single sheet or fan fold paper. An optional tractor feed will be available but was not included for this evaluation. The printer will handle multiple copy documents or forms up to a maximum thickness of .022 inches. It has a manual "fine adjustment" line spacing which allows precise alignment for forms.

The TP-1 is very small and lightweight (20 lbs.) It was designed for desktop or tabletop use. Its small "footprint" allows it to fit in places where some competitive printers will not. It is 6.5 inches high, 19.5 inches wide and 13.5 inches deep.

The TP-1 has the following controls:

Top of form
Impression control
Manual paper release
Manual paper advance
Paper position indicator
Line spacing
Hammer release
On/Off switch

The TP-1 platten allows paper up to 13 inches wide (33 cm). Our only question here was why not go another inch and a half and use standard computer output paper? Mr. McCarthy told us the platten was a standard typewriter platten. (Perhaps they are saving this feature for a model TP-2?).

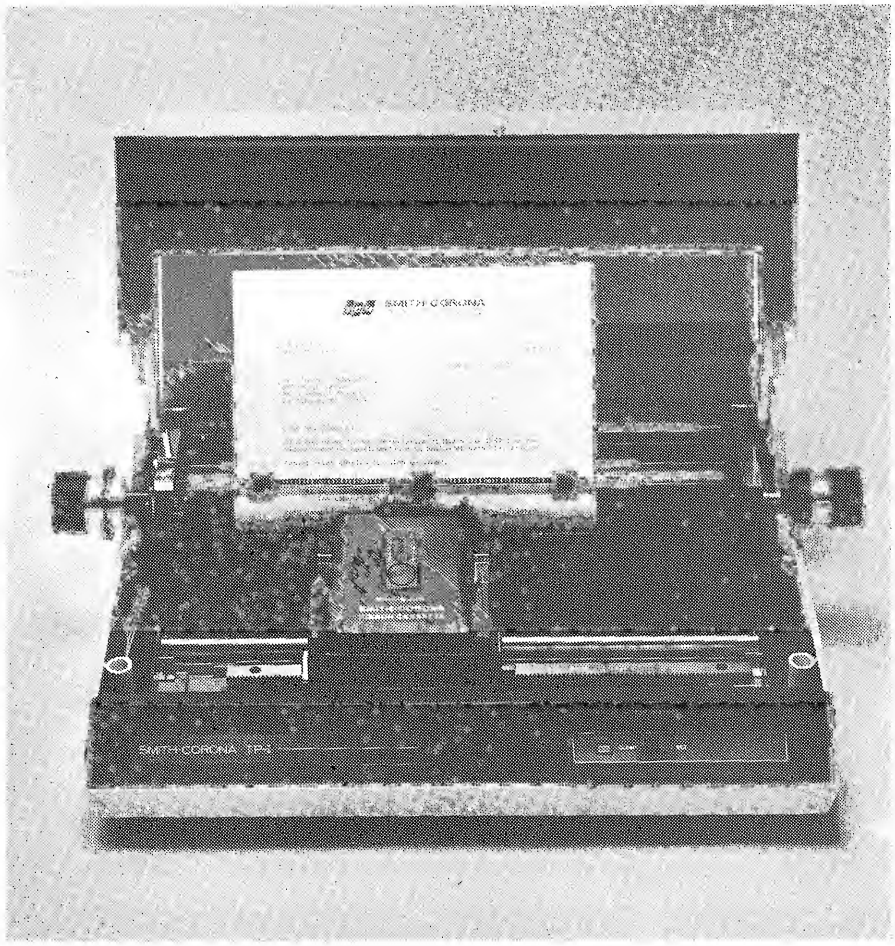
The life of the printer is estimated to be between 30 and 40 million characters with periodic preventitive maintenance. The daisywheel is expected to last 2.5 million characters. Single-strike film ribbons are good for about 57,000 characters. Multi-strike and long life fabric ribbons should go for about 250,000 characters. The mean time between failure on the printer is 10 million characters and the average repair time is one hour. These figures are taken from the manufacturer's specification sheet.

The printer utilizes the same ribbon cassettes as the Typetronic typewriter. The only difference in the printer is that the ribbon lift mechanism has been removed in the printer so the printer cannot support two-color printing or correction tape. Used as a word processor, there should be little need for correction tape.

Presently eight typestyles are available: five for the 10-pitch and three for the 12-pitch. Additional print wheels will be announced shortly.

Our overall impression of this printer is excellent. True, its speed is such that continuous, heavy-duty printing would be out of the question. For occasional word processing and listing of programs for the home or small office computerist however, it is an exceptional bargain. ■

Manufacturer's suggested retail price of the TP-1 daisy wheel printer is $895. Additional information available from Smith-Corona at 65 Locust Avenue, New Canaan, CT 06840.



Marking Smith-Corona's entrance into the data and word processing fields, the new Smith-Corona TP-1 text printer utilizes advanced electronic technology. It offers the user the benefits of a dependable, high-quality printer at about half the price of other daisywheel printers.

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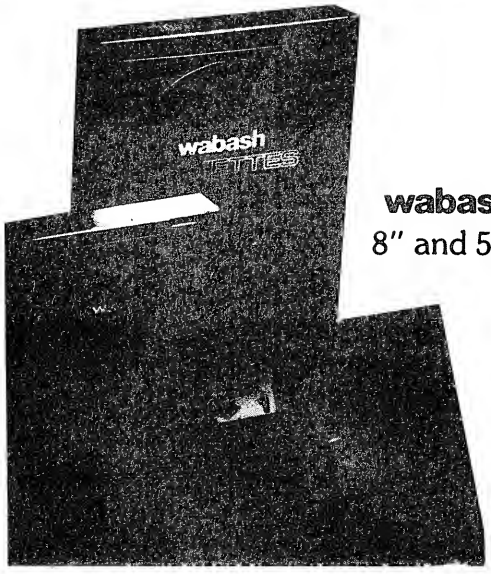

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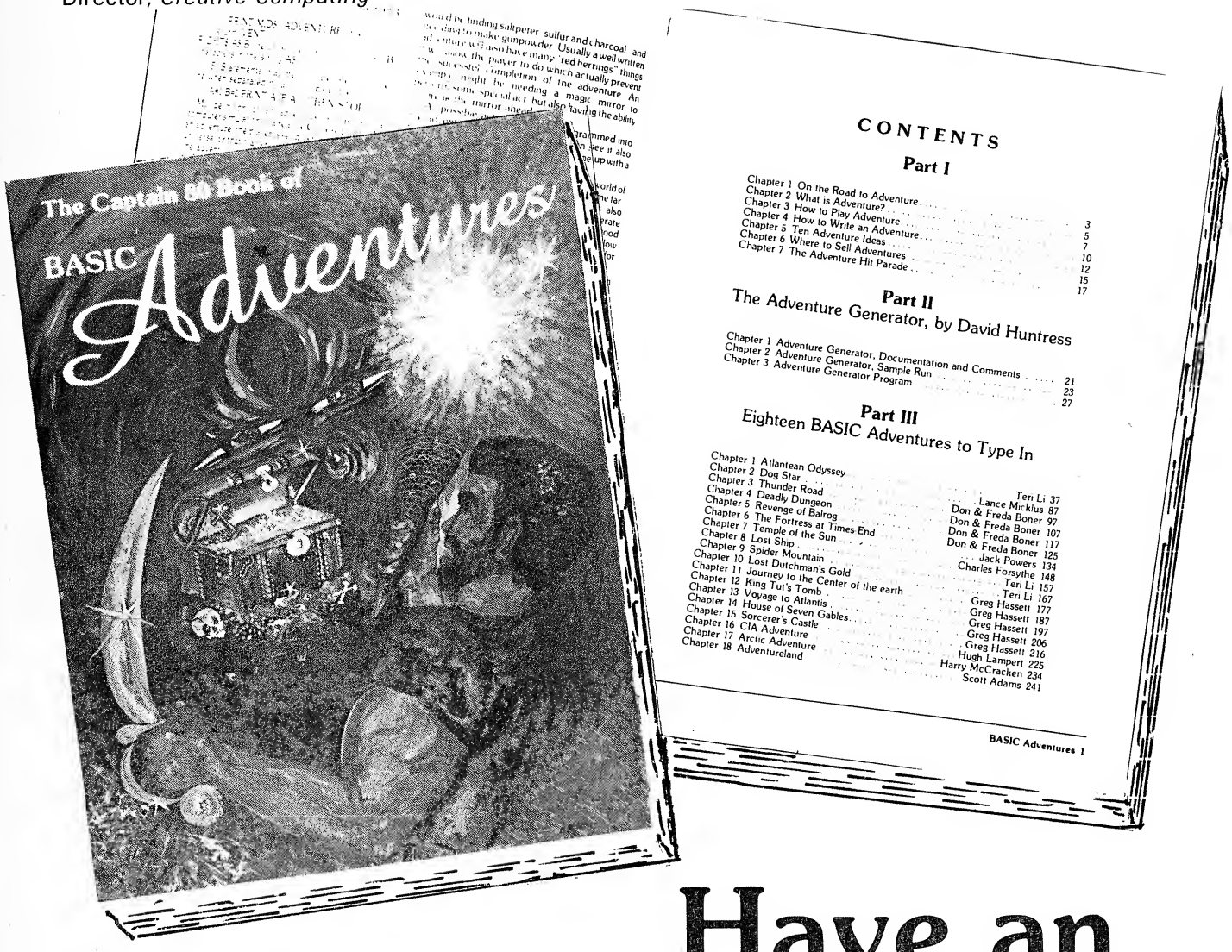

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"I've got it!"

An overview of Model 16

Mike Schmidt, Publisher

It finally arrived. The new Model 16 sports an off-white case, green phosphor screen and a smart-looking keyboard. It also has two thinline disk drives and comes with 128K of memory.

There are three monster-sized manuals and one pamphlet included. The pamphlet says "Read me first." I did. Then I read the other manuals, and went back to "Read me first." Two hours later, I had yet to insert my first diskette into the machine. I am not that slow, but I wanted to make sure (with only one system diskette at that point) that I would not be trying to backup all over it.

Reading the documentation reminded me of the problems we sometimes encountered when trying to put together an issue of *80-U.S. Journal*. Imagine this: the manuals must cover a Model II which is upgraded (but not quite all of the way); Model II diskettes being read by the Model 16; Model 16 running in Model II (TRSDOS-II) mode; and finally, Model 16 actually running as a Model 16! I'm amazed it only took two hours of reading.

The first thing I wanted to know more about was that 128K. Was it really 128K, and of what size words? The answer is 128K of eight-bit bytes. That equates to 64K of sixteen-bit words.

My burning curiousity about dual-sided diskettes led me next to the disk drives. Could you really get drive zero, one, two and three with just two physical diskettes? No, you can't. But, you can get 154 tracks on just one diskette, since it writes both sides. I formatted a data diskette in drive one and checked for free space. It said 1.26 *megabytes*! Our Model II (with four drives) only has two megabytes total.

On the Model 16, the drives don't run all of the time like they do on the Model II. That's nice. There is something in my puritan upbringing that rebels at diskettes turning for hours when they are not being accessed.

Another thing they have done to the diskettes is to change them to 32-sector tracks. Also, there are no more granuals. (Yaaay!) Each sector can contain 256 bytes. They have done away with the free space map. (Boo.) Instead, it just tells you how many extensions there are and where they start. I miss the security of seeing the layout of the diskette.

You may ask what happens to compatibility now that there are 32 sectors per track. That is taken care of very nicely with a utility called FCOPY. With it, you can insert a Model II diskette in drive one and FCOPY it (or any part of it, including system files) to a dual-sided, TRSDOS-II diskette in drive zero. You can also reverse the process. It works.

The Model 16 also runs as a Model II — just insert your TRSDOS system diskette in drive zero and boot up. There really is not much difference between normal Model II TRSDOS and TRSDOS-II. There are a few new library commands in TRSDOS-II — FCOPY is one of them. DRIVE lets you set the access time of the drives and other things like wait on error and door detect on/off. FILES will show you an alphabetical list of the files on your diskette. It's like DIR, except that you don't have to look at all of the other information that normally accompanies DIR. ANALYZE is no longer there (who used it anyway?).

You're probably wondering why I haven't mentioned the M68000. So far, it hasn't gotten into the act. The only thing available for it (at this point) is an editor, an assembler, and a linker — no BASIC or operating system. I say "at this point," because you know somebody just *has* to do it.

Terry Dettmann (associate editor) came down one night to see the new machine and we fired up the editor. There is a sample program in the manual which we typed in. After making the usual number of mistakes with a new editor, we finally got it right and assembled it without errors. It wouldn't run, because even though there is one program, it must be linked. So we linked it and were finally able to execute the program. It printed the letter "A" on the screen and went back to TRSDOS-16 Ready! We're going to have to get hot with 68000 asembly codes until a BASIC comes out for it.

Oh, did I mention that you can hang up to eight drives on this dude? It really floored me when it came up and said "Drive (0-7) . . ." You could run 10 megabytes with the Model 16 without even having a hard disk.

Playing at being an oracle, I see us going to a hard drive, more memory (you can get up to 512K), a couple of terminals and timesharing! We will be running a full-scale evaulation on the Model 16 by Harry Avant in a future issue. I just thought it would be nice to let you know of my first impressions. ■

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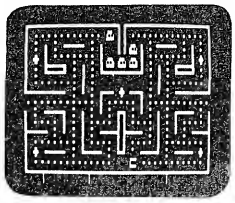

From Cornsoft Grop
Race your Scarfman around a maze, gobbling up scoring dots. You are pursued by five monsters: if you eat a "+" they'll lower their eyes and you can eat them, otherwise they'll eat you! SCARFMAN may be played using the keyboard, Alpha Joystick or Trisstick.
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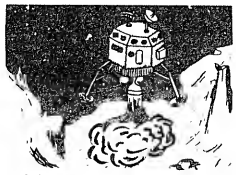

By Wall & Moncrief from Adventure Int. You get a vast lunar landscape, graphically depicted in both long range and close up, with many choices for landing sites. Choose a more difficult site and get more points—if you can land successfully. Great graphics and sound add to the realtime challenge and fun. Joystick compatible
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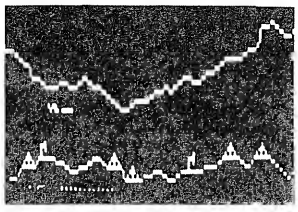

By Philip Mitchell from Beam
Armed with missiles and bombs, you must fly your fighter to the enemy's cache of neutron bombs and destroy them. Your mission is in four stages, involving rugged terrain, caverns and manmade obstacles—not to mention enemy radar, missiles and paratroopers. This new departure in arcade gaming allows you to set up your own terrain and enemy emplacements, then save them for future use. Make your mission as hard or easy as you like. Joystick compatible. *Save 20%!*
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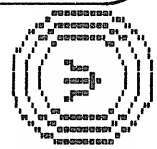

From Cornsoft
Ahead of you lies the menacing castle, floating in space amidst its layers of orbiting shields. At intervals, smart mines spin off the shields and head for your ship. Dodging the mines and destroying the shields isn't your only problem, though: once you penetrate the innermost shield, The evil Yugdab will unleash all his fury in an attack! A fast-paced and challenging arcade game. Indeed. Joystick compatible. *Save 20%!*
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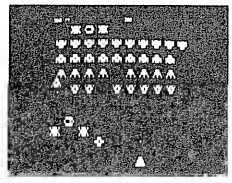

By Hogue & Konyu from Big-Five
"The rage of the arcades" is now available for TRS-80! Exciting sound effects add to the action as the invaders swoop down to destroy your base. Even while you have your hands full battling the aliens, you have to watch out for the Flagship! Super, graphics, super action, super fun! Joystick compatible.
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By Hogue & Konyu from Big Five
Asteroids surround your ship. You must shoot the asteriods, as well as any of the five types of alien spaceships. Use your thrusters for full movement and rotation of your ship—if you are overwhelmed, you can even jump to hyperspace! Written in fast machine code with superb graphics, this game is GREAT! Joystick Compatible.
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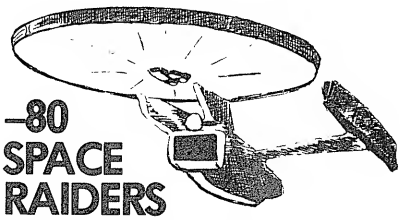

From Bosen Electronics
You are in command of the Starship "Defiant." The center of the screen is your window to the vastness of three dimensional space. Your orders are simple enough: Patrol the area and destroy all enemy spacecraft; return to base as needed for repairs and supplies. Carrying out these orders is more difficult! An exciting and fast-paced game, it presents an animated pilot's-eye view. *Save 20%!*
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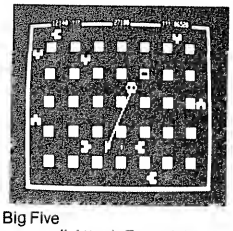

By Hogue & Konyu from Big Five
Unlike the usual "shoot-em-ups," Attack Force lets you control both speed and direction as you maneuver all over the screen in search of the alien Ramships and Flagships. Enemy ships chase you everywhere, and the Flagships' lasers can fire in any direction! The Ramships can even impersonate your spacecraft, so don't look away even for an instant. Machine language action with sound. Joystick Compatible.
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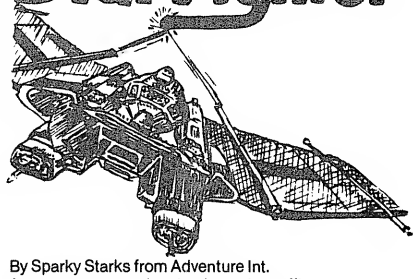

By Sparky Starks from Adventure Int.
As mercenary and galactic police officer, you must maintain the condition and control of all parts of your spacecraft. You sit at the controls while peering out of the digital spaceview port. Suddenly something appears on your screen: is it a Starpirate or a friendly merchant ship? You can't tell yet, and at this speed you may have only a fraction of a second to make an attack/no attack decision.
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Larry Krengel, Elmhurst, IL

Here is a program that I, as a teacher, use regularly to help me produce multiple choice tests. It is not a fancy program, but a useful one. I have set it up to drive my MX-80 printer.

The program analysis should provide you with insight into the structure of the program. I have tried to highlight those portions of the program which a fellow part time do-it-yourself programmer might be able to capitalize on.

You may note that provisions are made for using the @FREEZE program and a Stringy Floppy.

Program Analysis

100 clear 12000 — makes for 12000 bytes of string data.

110 dimensions arrays: 50 questions (Q$(50)) — 250 answers (A$(250)) — and 50 correct choices (C$(50)).

120-210 prints introductory information then waits (INPUT W$) — the reason for the $ making W a string is to allow for any erroneous input without receiving a "redo."

500-550 prints the menu.

560-610 an inkey$ loop. This looks for a single character input to move the program to the next step . . . no enter is necessary. 560 begins with A$="" so the loop always starts with A$ being a null.

1000-1140 enter questions and answers.

1050 causes the program to return to the menu if no question is entered for a given number.

1090 prints the prompt (letters A thru E) for the five answers. CHR$(64+Y) prints the letters in response to the Y=1to50 loop. The CHR$ code for the letters A-E are 65-69. The fancy A$((X-1)*5+Y) positions the answer in the A$ array which is 250 large. (e.g., the answers to question #2 are at 6 through 10 in the A$ array.)

1100 interrupts the loop before the fifth answer is given when no answer is entered. Sends the program to 1120 where the correct answer is entered.

1130 checks to see that the correct answer that is entered is really in the A to E range. If it is not, it re-asks the question.

2000-2800 allows the author to delete, correct or examine the questions.

2020-2090 an inkey$ loop that gives the program direction.

2100-2170 is used for deleting an unwanted question. The question is printed out before the question is deleted to confirm the identity of the question. Once again an inkey$ loop is used in 2140-2170.

2300-2440 is used to correct questions.

2500-2800 list the questions one at a time for examination.

3000-3400 prints the test.

3020 the author must now name his test.

3030 informs the author that he may stop the printing by entering a "S". The inkey$ command is placed throughout the printing instructions to accomplish this. This allows the author to stop a bad printing. There is nothing as frustrating as watching a bad printout all the way to the end!

3050 P= page number LN= line number (to know when to page) Q= question number (allows for deleted questions in the Q$ array). TAB((40-(LEN(TN$)))/2) prints the test name (TN$) centered on the page (using 40 char./line).

3080 skips any questions in the Q$ array that are blank.

3090 prints any question less than 50 characters in length. It will fit on one line. LN=LN+2 acknowledges the fact that it required one line to print and skipped a line in preparation for the next line.

3100 prints the first 40 characters of lines that have more than 50 characters.

3110 begins printing with the 41st character and prints until it finds a space (" "). When the space is found, 3120 prints the remainder of the question on the following line.

3130 begins printing the answers.

3140 stops printing answers when an answer is blank (" ").

4000 begins the routine that allows those authors with an Exatron Stringy Floppy to @FREEZE (store in total) the program and questions.

Figure 1
Sample Test and Answers

```
                                        NAME:
                                        DATE:

                    Astronomy Quiz

CHOOSE THE BEST ANSWER.

1 .  If you were to look in an astronmy book from the y ear
     1900 how many planets would be mentioned?
```

A. 6

B. 7

C. 8

D. 10

2 . Which planet is larger than the earth?

A. Mercury

B. Neptune

C. Pluto

D. Mars

3 . What is the earth's period of rotation?

A. 1 day

B. 365.25 days

C. neither of the above

4 . The moon has an atmosphere similar to that of the earth's.

A. True

B. False

5 . STS is an abbreviation for

A. Standard Terrestrial Systems

B. Space Temperature Systems

C. Space Transport System

D. Solar Travel System

6 . The temperature on Mercury is

A. very hot

B. very cold

C. both hot and cold

D. not known

7 . The canals on Mars were first noted by

A. Jules Verne

B. Percival Lowell

C. Albert Einstein

D. Galilei Galileo

8 . We live in the Milky Way Galaxy.

A. True

B. False

9 . Some solar systems have more than one sun.

A. True

B. False

Astronomy Quiz — ANSWERS

1 C
2 B
3 A
4 B
5 C
6 C
7 B
8 A
9 A

Program Listing for Test Maker

```
1 ' TESTMAKER BY LARRY KRENGAL
2 REM ### produces a multiple choice te
  st with up to 50 questions ###
3 REM ### each question may have as man
  y as 5 answers ###
4 REM ### a list of correct answers is
  printed at the end ###
5 REM
6 REM ###  11/81 ###
7 REM
8 REM
100 CLEAR11000
110 DIM Q$(51),A$(250),C$(50)
120 CLS
130 PRINTTAB(15)"T E S T  M A K E R":PR
  INT:PRINT
140 PRINT"THIS PROGRAM WILL PRODUCE A M
  ULTIPLE CHOICE TEST WITH UP"
150 PRINT"TO 50 QUESTIONS.  EACH QUESTI
  ON MAY HAVE AS MANY AS 5 ANSWERS.":PR
  INT
160 PRINT"TO END TEST ENTER NO QUESTION
   FOR A NUMBER.  IF LESS THAN"
170 PRINT"FIVE ANSWERS ARE DESIRED FOR
  A GIVEN QUESTION, JUST ENTER"
180 PRINT"FOR QUESTION LETTER (ANSWERS
  ARE LETTERED)."
190 PRINT:PRINT"A LIST OF CORRECT ANSWE
  RS WILL BE PRINTED AT THE END.":PRINT
200 PRINT"          ENTER TO CONTINUE"
210 INPUTW$
500 REM ### MENU ###
510 CLS:PRINTTAB(15)"T E S T  M A K E R
  ":PRINT:PRINT
520 PRINT"1- ENTER QUESTION
530 PRINT"2- EXAMINE/CORRECT QUESTION"
540 PRINT"3- PRINT TEST
550 PRINT"4- @FREEZE"
560 A$="":A$=INKEY$
570 IFA$="1"GOTO1000
580 IFA$="2"GOTO2000
590 IFA$="3"GOTO3000
600 IFA$="4"GOTO4000
610 GOTO560
1000 REM ### ENTER QUESTIONS ###
1010 FORX=1TO50:IFQ$(X)<>"":NEXT
1020 CLS:IFX=51GOTO500
1030 PRINT"ENTER QUESTION NUMBER ";X:PR
  INT:PRINTX;". ";
1040 INPUTQ$(X)
1050 IFQ$(X)=""GOTO510
1060 PRINT:PRINT"INPUT ANSWERS -":PRINT
1080 FORY=1TO5
1090 PRINTTAB(8)CHR$(64+Y);". ";:INPUTA
  $((X-1)*5+Y)
1100 IFA$((X-1)*5+Y)=""GOTO1120
1110 NEXTY
1120 PRINT:INPUT"ENTER CORRECT ANSWER -
  ";C$(X):IFC$(X)=""GOTO1120
1130 IF(ASC(C$(X))<65)OR(ASC(C$(X))>69)
  GOTO1120
1140 GOTO1010
2000 REM ### CORRECT QUESTION ###
2010 CLS
2020 PRINT"1- DELETE QUESTION
2030 PRINT"2- CORRECT A QUESTION
2040 PRINT"3- LIST ALL QUESTIONS AND AN
  SWERS
2045 PRINT"4- BACK TO MENU"
2050 A$="":A$=INKEY$
2060 IFA$="1"GOTO2100
2070 IFA$="2"GOTO2300
2080 IFA$="3"GOTO2500
2085 IFA$="4"GOTO510
2090 GOTO2050
2100 CLS
2110 INPUT"ENTER NUMBER OF QUESTION YOU
   WISH TO DELETE";N
2120 PRINT:PRINTQ$(N)
2130 PRINT:PRINT"DO YOU WISH TO DELETE
  THIS QUESTION? Y/N"
2140 A$="":A$=INKEY$
2150 IFA$="Y"Q$(N)="":FORX=(N-1)*5+1TO(
  N-1)*5+5:A$(X)="":NEXT:GOTO510
2160 IFA$="N"GOTO510
```

There's a wealth of good information in these

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```
2170 GOTO2140
2300 CLS
2310 INPUT"ENTER NUMBER OF QUESTION YOU
   WISH TO CORRECT - ";N
2320 PRINT:PRINTQ$(N):PRINT
2330 PRINT"ENTER CORRECT QUESTION - (NO
   ENTRY = NO CORRECTION)"
2340 INPUTCR$
2360 IFCR$<>""Q$(N)=CR$:CR$=""
2370 N1=(N-1)*5+1
2380 CLS:PRINT"ENTER CORRECTED ANSWERS
  - (NO ENTRY = NO CORRECTION)"
2390 L=65:FORX=N1TON1+4
2400 PRINTTAB(8)CHR$(L);". ";A$(X):PRIN
  TTAB(8)CHR$(L);". ";:INPUTCR$
2420 IFCR$<>""A$(X)=CR$:CR$=""
2430 L=L+1:NEXT
2440 PRINT:INPUT"Enter correct answer -
  ";C$(N)
2450 GOTO510
2500 REM ### LIST QUESTIONS ###
2510 Q=1
2520 FORX=1TO50:CLS
2530 IFQ$(X)=""GOTO2700
2540 PRINT"QUESTION #";Q;TAB(30)"ARAY
  #";X:PRINT
2550 PRINTQ$(X):PRINT
2560 FORY=1TO5:IFA$((X-1)*5+Y)=""GOTO26
  90
2570 PRINTCHR$(64+Y);". ";A$((X-1)*5+Y)
  :PRINT
2690 NEXTY:Q=Q+1:INPUTW$
2700 NEXTX
2800 GOTO510
3000 REM ### PRINTING TEST ###
3010 CLS
3020 INPUT"ENTER NAME OF TEST";NT$
3030 PRINT:PRINT"ENTER WHEN PRINTER IS
  READY..."
3040 INPUT"'S' WILL STOP PRINTING AND R
  ETURN TO MENU.";W$:LPRINTCHR$(27)CHR$
  (69);
3050 P=1:LN=8:Q=1:LPRINTTAB(50)"NAME:":
  LPRINTTAB(50)"DATE:":LPRINTCHR$(10)CH
  R$(14)TAB((40-(LEN(NT$)))/2)NT$:LPRIN
  TCHR$(10)"CHOOSE THE BEST ANSWER."CHR
  $(10)
3055 N=1
3060 A$="":A$=INKEY$:IFN>50GOTO3340
3080 IFQ$(N)=""GOTO3300
3090 IFLEN(Q$(N))<60LPRINTQ;".  ";Q$(N)
  :LN=LN+2:GOTO3130
3100 LPRINTQ;".  ";LEFT$(Q$(N),50);
3110 FORX=51TOLEN(Q$(N)):A$=INKEY$:IFMI
  D$(Q$(N),X,1)=" "GOTO3120
3115 LPRINTMID$(Q$(N),X,1);:NEXT
3120 LPRINTCHR$(10)TAB(6)RIGHT$(Q$(N),L
  EN(Q$(N))-X):A$=INKEY$:LN=LN+3
3130 FORX=1TO5:A$=INKEY$
3140 IFA$((N-1)*5+X)="":LPRINTCHR$(10):
  GOTO3190
3150 LPRINTCHR$(10)TAB(6)CHR$(64+X)".";
  TAB(10)A$((N-1)*5+X)
3160 IFLN>50LN=2:P=P+1:LPRINTCHR$(12)"P
  AGE ";P
3170 IFA$="S"GOTO510
3180 LN=LN+2:NEXTX:LPRINTCHR$(10)
3190 Q=Q+1
3300 IFLN>50LN=2:P=P+1:LPRINTCHR$(12)"P
  AGE ";P
3310 IFA$="S"GOTO510
3320 N=N+1:GOTO3060
3340 LPRINTCHR$(12)CHR$(14)NT$;" -  ANS
  WERS"CHR$(10)
3350 N=1:FORX=1TO50:IFQ$(X)<>""LPRINTN;
  "  ";C$(X):N=N+1
3360 NEXTX
3400 GOTO510
4000 REM ### @FREEZE ###
4010 CLS:INPUT"IS @FREEZE LOADED? Y/N";
  A$:IFA$<>"Y"GOTO510
4020 INPUT"WHAT FILE NUMBER DO YOU WISH
  ?";F
4030 INPUT"ENTER WHEN WAFER IS READY...
  ";W$
4040 @FREEZEF
4050 GOTO510
```

■

Meet the Supermonitors

Make A. L. programming easy

Model I/III

Paul F. Secord, Houston, TX

If you started doing assembly language programming on the TRS-80 a couple of years ago, and if you are like many users, you may still be using T-BUG and RSM-2 to debug your programs. Radio Shack's T-BUG was the first monitor available, and it provided a valuable register display, but it would not disassemble a machine language program. Small System Software soon filled that gap by supplying its RSM series of monitors, which offered many other useful features, in addition to disassembly. You may well have been quite satisfied with what you have been using. If so, you are in for a surprise.

The new monitors on the market are highly sophisticated and extremely powerful. You can greatly shorten the time it takes to get your program debugged and running. Moreover, some of them make learning assembly language easier than ever before. This article will outline their features and indicate their advantages and limitations, as well as the various purposes for which they might be used.

First, let's get clear on some terms. A *disassembler* is a program that will take a machine language program consisting of hex bytes, and translate it into the mnemonics of assembly language, which are much easier to understand. Instead of CD0050, you get CALL 5000H, which is like a GOSUB command in BASIC.

A *debugger* examines a program that you have written, with the aim of helping you to find out why it doesn't work. Typically, it contains many routines to serve this end, such as search, convert hex to ASCII, examine registers, change memory or registers, trace, etc. the TRON function (trace on) of BASIC is an example of a debugging routine.

Finally, *monitor* is a more general term that often combines disassembly and debugging routines, and which sometimes includes additional utilities (e.g., tape loading and tape reading routines). These various distinctions are important. Which monitor is best for you depends partly upon what you want to use it for.

Disassemblers play a part in debugging, but they also have a somewhat different use. Undocumented machine language programs are notoriously difficult to understand. If you failed to document a program that you wrote yourself, after a month or two of not using it, you are apt to have considerable difficulty understanding how it works! Given this, imagine how difficult it is to make sense out of an undocumented program written by someone else! Yet, we often are motivated to do this because we want to make some changes. Perhaps you want to modify SCRIPSIT so that you can send commands to the printer that will change type fonts. Whatever the reason, disassembly of machine language into Z-80 mnemonic instructions is the first step.

The general purpose monitors reviewed here are: MICROMIND, STEP-80, TASMON, ULTRA-MON, SUPERSTEP and BUGOUT-PRO. Two earlier versions of BUGOUT are also available at lower prices. They have many of the features of BUGOUT/PRO, but are not relocatable, they lack search and a few other features. All references, from this point on, to BUGOUT should be taken to mean BUGOUT/PRO. These six are the best general purpose monitors that I have been able to find for tape/disk users who have either TRS-80 Model I or III. Table 1 provides some general information concerning their cost and vendor sources.

The specialized TLDIS disassembler (Instant Software) and MISOSYS Disassembler 1.2 (Acorn Software) are not covered here because they are designed only for disassembling, not for debugging. Several general purpose monitors are not reviewed because of serious deficiencies.

Radio Shack's new DEBUG for Model I/III tape users is far more powerful than T-BUG. But alas, it is located at 4200H to 49FFH, and will interfere with many programs because it is not relocatable. Worse yet, to use DEBUG, Model I users

have to keep the Expansion Interface turned off!

Howe Software's Monitor 3 does not have "single step," and the otherwise excellent X-BUG does not have a disassembler. Microsoft's excellent Z-BUG can be purchased only with their Editor-Assembler Plus. Although at $29.95, the whole package is a steal, Z-BUG is not relocatable.

The six monitors reviewed have none of these limitations. MICROMIND is designed only for the Model I, but the other five monitors are suitable for either the Model I or III. All can be used with disk or tape.

Common Features of General Purpose Monitors

Let's look at the features that are common to most general purpose monitors. Following that, I will discuss the special features of each of the monitors, including some unique innovations.

Register Displays

All of the monitors display the contents of the registers (AF, BC, DE, HL, IX and IY), as well as the alternate, or prime set (AF', etc.). They also include the program counter with the address of the instruction currently pointed to, the stack showing the address at the top, and the state of each of the flags. Additional information is provided. For example, registers often contain an address which in memory holds a byte of information or another address. MICROMIND shows this byte for each register. STEP80 displays such contents for HL and for each address given in Z-80 instructions. TASMON shows such contents only for the address in HL, but ULTRA-MON, SUPER-STEP, and BUGOUT provide full screen displays with a great deal of extra information, along with additional display windows, or blocks, that can be called up as needed. Displays for SUPERSTEP and BUGOUT are discussed in the last section.

Breakpointing

Breakpointing is similar to inserting a STOP command in a BASIC program, in order to determine whether (at that point) what is supposed to happen actually has taken place. For example, if an instruction should have been printed on the screen, but it's not there, you know that something is wrong with that part of the program. All of the monitors reviewed here include breakpointing. It's also especially valuable for executing part of a program at normal speed in order to quickly reach a suspected bug.

Single Stepping

The most powerful routine for finding bugs is single stepping, and the absence of this feature in T-BUG and the RSM monitors is their most serious limitation. Single stepping is typically used when you have an especially ornery bug that refuses to be trapped. It also is a great tutoring aid for learning assembly language. This routine executes one program statement at a time, and pauses until commanded to execute the next statement in order. During that pause, you can examine what has happened by looking at register and block displays, and you can change any element in RAM, or in the registers. In that way you can find out exactly what is going on at each point in the program.

An especially valuable feature of all of these monitors is that, while single stepping, they "remember" their place. You can stop single stepping to examine or change registers or memory, and then automatically return to where you left single stepping.

You might think that single stepping through an entire program would be very instructive, and that it would easily identify all bugs. You would be right, except that it would take an enormous amount of time. Most programs involve many repetitions of instructions, so that tens of thousands of instructions are apt to be executed. A simple delay loop for holding a display on the screen for 60 seconds might, itself, execute thousands of instructions. Looking at an entire program, one instruction at a time, is much too tedious.

One way around this problem is to insert breakpoints just before suspected bugs. This allows execution at full speed to the breakpoint; then single stepping can be used to explore only problem areas. Other powerful routines have been devised to make single stepping more efficient, such as variable speed stepping and executing calls to subroutines at full speed. Stepping automatically from instruction to instruction at a convenient speed set by you is another helpful feature. All of the monitors reviewed permit automatic stepping at various speeds.

Execution of Calls, Jumps and RSTs

A feature associated with single stepping pertains to calls, and other branch points like conditional jumps. When stepping automatically at slow motion speeds, it is sometimes desirable to pause at branch points or calls. MICROMIND and STEP80 do this. By holding down a key, MICROMIND and STEP80 have the option of rapidly stepping through (at about 100 instructions per second) all non-branching instructions, always stopping for calls, jumps and RSTs. The other monitors do not have this manual option (except by setting breakpoints), but all have variable speed automatic execution while single stepping.

In a sense, stopping at branch points is like having automatic breakpoints which do not have to be set or removed. For example, you may wish to see whether the registers have the proper contents before entering a particular subroutine. If you know that the subroutine is right, you would want to execute it at full speed, then return to single stepping. The subroutine call might be to ROM, and it might contain a delay loop. To single step through such a subroutine would be extremely tedious and non-informative. The ability to execute the subroutine immediately is a powerful aid.

All of the other monitors have the option of either stepping through one instruction at a time, or executing calls in full (including calls within the calling routine). Full execution is invaluable for going rapidly through a long, unfamiliar program, in order to determine its general structure. With it, you can very quickly

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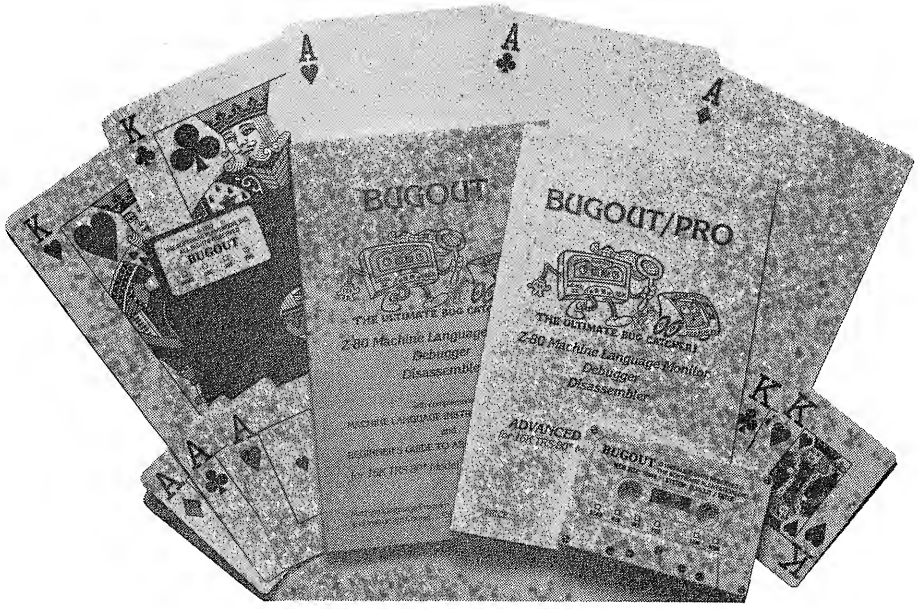

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identify the major routines, momentarily ignoring the lesser ones. Without it, stopping at every call in a complicated program can quickly lead you to lose your bearings.

Control and Interpretive Traces

Anyone who has used a monitor has discovered what Allen Gelder calls dangerous bends; taking these, causes the monitor and program to crash. Of course, program errors can cause control to jump to some part of ROM or RAM which takes it out of the monitor and the program. But there are many other ways of losing control. For example, a monitor necessarily must control its video display, and thus must place a jump to itself in the video driver. But if the program being examined also places in the video driver a jump to itself, then ZAP!!! The monitor display disappears! At least it does in most cases.

The monitors reviewed here have developed a technique for avoiding this kind of crash. Instead of actually executing the program, instruction by instruction, these monitors simulate execution, and display what the registers would be as if each instruction were executed. In this way, the monitor retains control under almost all circumstances. Moreover, this technique makes it possible to single step and to set breakpoints in ROM as well as RAM. This feature is lacking in MICROMIND.

With an ordinary monitor, the attempt to trace a program through single stepping is blocked with a hangup whenever that program calls for keyboard input. This occurs because accessing the keyboard requires a fast scanning loop which continues until a key is pressed. Single stepping executes only one instruction at a time, too slowly for sensing a key press. Our monitors have eliminated this problem, too, by automatically reverting to a normal scanning loop whenever a program calls for keyboard input.

Graphics Displays

One of the most valuable features possessed by some of these monitors is the ability to display the program graphics in slow motion, along with the Z-80 instructions that produce the features of the display. MICROMIND, STEP80, and SUPERSTEP do this by reducing the disassembled instruction to one or two lines of minimal information at the bottom of the screen, leaving the rest of the screen available for program displays, including graphics. As you step along, each new portion of the graphic display corresponds to the instructions at the bottom. In this way, you can see how some of the exciting graphics (in such games as Supernova) are created. Or, you can watch Sargon II constructing, bit-by-bit, the board and pieces on the screen. Of course, this feature also helps to find the bug in your own program where the display goes awry.

Another method of dealing with graphics, used by TASMON and BUGOUT, allows you to view the entire screen by switching back and forth between the whole-screen register display and the whole-screen graphics display. BUGOUT does this automatically if commanded, while TASMON requires keyboard commands for each alternation. ULTRA-MON has no provision for single stepping graphics displays.

Line Printing

MICROMIND lacks an option for line printing and so does the present version of SUPERSTEP. The new STRETCH SUPERSTEP (for disk users only) will remedy this shortcoming. STEP80 provides several lineprint options while disassembling or single stepping. BUGOUT is the most flexible here. An "enable printer" command allows line printing of virtually any of the operations: single stepping, interpretive tracing, contents of memory, etc. TASMON and ULTRA-MON allow a screen print at any time, as well as several other printing options.

Utilities

The monitors differ considerably in providing utilities. There is always a compromise between using up additional memory and providing conveniences. MICROMIND has a search command, ASCII displays and dumps, hexdecimal conversions, and provisions for recording a program on tape in systems format. STEP80 and ULTRA-MON are similarly equipped except that they lack conversions and a search command. ULTRA-MON also has a utility for relocating object code programs. TASMON has these utilities as well as a unique one for converting opcode programs to source program format. SUPERSTEP has fewer utilities, but is unique in having a utility for punching fast-loading tapes. BUGOUT has almost every utility that a programmer might want (e.g., see search commands in the next section).

The Ultimate Monitors

SUPERSTEP and BUGOUT deserve separate discussion, for they represent the current state of the art and have powerful features not generally found. In fact, the latter two monitors are just entering their latest phase at the time of writing. Allen Gelder tells me that a new version called STRETCH SUPERSTEP (for disk users only) is about to become available, and I am reviewing BUGOUT from a preliminary manual to be replaced by a final version soon.

These two supermonitors are superbly designed to let the computer do some of the intelligent work of debugging a program. This is reflected in their full-screen displays and in additional windows or blocks that can be called up. Their displays include intelligent RAM windows that (as each instruction is stepped), automatically display the content of an address in HL, in the index registers IX and IY, or in the instruction itself. You need to see the screen displays to fully appreciate them.

These block displays provide many options. They can be set not only to any address in ROM or RAM, but also to the stack pointer or any of the registers. As new instructions are stepped, their contents will change automatically (if the instruction is relevant to the block contents). If nearby information is not covered by the block, it can be scrolled to lower or higher addresses! Many other

display options are available. The blocks can be removed, and so can the registers, to display a simple disassembly.

SUPERSTEP has a very different (but equally impressive) format and capability. Its initial display consists of two full sets of registers. One set displays states preceding the current instruction, and the other, states following execution. Also included is a floating block like that of BUGOUT, automatically displaying the contents of a register or address in the current instruction, including adjacent addresses. Moreover, the "before" execution display block can be replaced by five blocks ranging in size from one to eight bytes. Each can be set to reveal various address contents automatically, as the instructions are stepped through. As mentioned earlier, SUPERSTEP's display can be reduced to a single line in the bottom left corner of the screen, allowing the user's program to control the screen as instructions are stepped through. An option, unique to SUPERSTEP, displays the execution time of the current instructions with a cumulative record of time elapsed from the starting point in an earlier instruction. Like BUGOUT, the various displays can be scrolled backward or forward.

Intelligent displays, such as these, lessen the need for search commands. SUPERSTEP has only one. BUGOUT has 10 search commands including byte, word, ASCII and various opcode searches. For example, you can search for CD0050 if you want to find all instances of the instruction, CALL 5000H, and you can search for any ASCII string up to 22 characters long. You can also insert XX in any search command wherever you don't want to specify one or more bytes: Searching for CDXXXX would provide a list of all unconditional CALL instructions.

These supermonitors allow the use of breakpoints at specific ROM or RAM addresses, as described earlier. BUGOUT has some unique breakpointing features. Breakpoints can be set to stop at a given byte, word, register content, or register pair content. Suppose that

you wanted to stop interpretive tracing when a particular graphics byte (say BFH) appeared at address 3D00H on the screen. You could do this by using a breakpoint command that recognizes when 3D00H contains BFH! Or, if you wanted to stop at all unconditional calls and jumps, you could do this by putting the hex byte CD in one breakpoint, and C3, in the other.

SUPERSTEP has a very convenient feature for changing registers or other content displayed on the screen. A command activates a cursor controlled by the directional arrows on the keyboard. To make a change, you move the cursor to the display contents that you want to change, and type in the new byte. In BUGOUT, you simply call up the register (or register pairs) that you wish to change. Another special feature of BUGOUT (also TASMON) allows users to add their own custom commands to it, and a variety of key addresses in BUGOUT are documented to aid in this extension.

Finally, BUGOUT (like TASMON and ULTRA-MON) provides a relocator that will do most of the work of relocating any machine language program. Using this routine, it took me only five minutes to move Sargon II to high memory and have it running. The main pitfall is that data or jump tables can be misinterpreted by the relocator, and have to be handled instead as block moves. Sargon II was easy only because I was very familiar with its structure. Both BUGOUT and TASMON provide helpful comments for finding and moving those parts of your program that are not Z-80 instructions.

Which is the Monitor for You?

If you are just getting into assembly language programming, if you program mostly in BASIC, if your budget is very limited, or if you have only 16K, then STEP80, ULTRA-MON or TASMON are your best choices. The otherwise excellent MICROMIND lacks a command that sends material to the printer. A printer command could be patched in. 16K users might value the printer command's brevity; it occupies only 3.8K bytes. All three monitors are inexpensive. STEP80 occupies only 4.1K bytes, and has most features one would need. ULTRA-MON, with only 4.5K bytes, has full screen capabilities almost as good as BUGOUT and SUPERSTEP. It is somewhat lacking in utilities, though, as might be expected from its compact size. TASMON occupies 8K bytes, and while it has a more limited display than ULTRA-MON, it has excellent utilities, like writing and reading system tapes, and writing and loading disk files. TASMON is also the only general purpose monitor that generates a disassembly which substitutes labels for addresses, and which provides a symbol table. You need to use your ingenuity to distinguish data sections from program (and clean these up), but ultimately, you can put the resulting source program into an Editor/Assembler for changing and reassembling.

If you do very much assembly language programming, if you want to achieve mastery of assembly language, or if you want the very best, then you should definitely purchase either SUPERSTEP or BUGOUT. You would be delighted with either, but your best choice depends upon your own needs.

BUGOUT comes with an exceptionally well-organized, clearly written 135-page manual (currently being revised and further improved) that is designed to teach novices how to use the Z-80 instruction set, as well as to thoroughly acquaint the user with BUGOUT routines. In addition, it has a separate manual for experts. BUGOUT has virtually every conceivable operation that might be desired by the novice or pro; it contains well over 100 commands.

SUPERSTEP is pitched more exclusively toward the expert. Novices (and even some experienced amateurs) would probably have difficulty with its limited documentation. It is the only monitor that provides a command for calculating execution times for Z-80 instructions, that has convenient commands for opening up space in your program for inserting new machine language bytes, and which provides a utility for punching fast-loading tapes. (Like other fast loaders, this works only if you haven't added the XRX cassette load modification.)

Whatever your choice among these six monitors, you will save countless hours in debugging and revising your programs, or in patching unfamiliar programs! ■

Table 1
VENDOR SOURCES AND SYSTEM REQUIREMENTS

MICROMIND — Mumford Micro Systems, P.O. Box 400D, Summerland, CA 93067.
Model I **3.8K bytes** **$16.95**

STEP80 — Mumford Micro Systems, P.O. Box 400D, Summerland, CA 93067.
Models I, III **4.1K bytes** **$16.95**

TASMON — The Alternate Source, 1806 Ada St., Lansing, MI 49810.
Models I, III **8K bytes** **$29.95**

ULTRA-MON — Interpro, P.O. Box 4211, Manchester, NH 03108.
Models I, III **4.5K bytes** **$24.95**

***SUPERSTEP** — Allen Gelder Co., P.O. Box 11721, San Francisco, CA 94101.
Models I, III **12.4K bytes** **$19.95 + T-BUG**

BUGOUT/PRO — The Software Plantation, P.O. Box 44623, Tacoma, WA 98444.
Models I, III **12.5K bytes** **$69.95**

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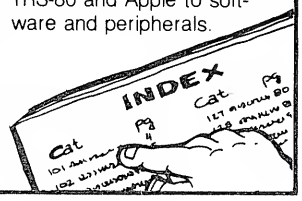

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DT-1

An evaluation of Radio Shack's new multi-user terminal

Harry Avant, La Crescenta, CA

What do you do if you are in the market for a video terminal and you need an 80 x 24 display with capabilities for half intensity, reverse video, variable cursor, baud rates up to 19,200 bps, ability to attach either a serial or parallel printer? What happens if you can't make up your mind between four of the top-selling terminals currently available? The answer is easy. Buy a Radio Shack DT-1 video terminal.

Tandy's new terminal incorporates several features, some of which are lacking in competitive terminals on the market. In addition to the 80 x 24 display, baud rates may be set via the keyboard from 75 to 19,200, and video attributes include normal, reverse, invisible, blink, underline and half intensity. A unique character generator displays special symbols for control codes in addition to easy-to-read standard alphanumeric characters.

This is Radio Shack's first entry, along with the new Model 16, to the world of multi-user data processing. As an integral part of the new Model 16 multi-user system, it is totally compatible with the 16's hardware and software, but that is only a beginning. In the past, Tandy has been content to limit its hardware compatibility to only those products produced in-house. The DT-1, however, is not limited in this sense Data Terminal 1 is a complete stand-alone terminal that is capable of providing communication with many other systems, from the S-100 types used in homes and small business to the largest mainframe computers used by industry and business, as well as Models I, II, III and 16.

The keyboard has the Model III's feel, but the differences are very noticeable. Keys are grouped into two sections. The main section has 58 keys and a 12-key multifunction keypad. Those who have used a Model I or III for communication with a large computer, and have lamented over missing escape and control keys, will find the DT-1 keyboard a real joy. Not only does it have escape and control keys, but several other special keys that are required for convenient communication with another system, such as a true backspace, delete, line feed, caps lock, reverse slash, square and curly brackets. In fact, all ASCII control codes and escape sequences can be generated on the keyboard. The alphanumeric keys are arranged in standard "typewriter format" which will be a minor nuisance to someone used to a Model I or III, but a real help to those who are used to a conventional typewriter keyboard layout.

The most interesting feature of the DT-1 is its emulation ability. It is possible to configure the terminal to emulate four popular terminals now on the market: a Televideo 910, Lear Seigler ADM-5, ADDS 25 or Hazeline 1410. The emulation mode, as well as I/O parameters, are entered via keystroke entry and stored in an EEPROM (electrically erasable programmable read-only memory). The following parameters may be programmed into the EEPROM:

Function	Abbreviation During Setup
Terminating character	TC1, TC0
Emulation mode	EM1, EM2
Reverse video	REV
Data terminal ready	DTR
Data set ready	DSR
Data carrier detect	DCD
Stop bit select	STB
Odd or even parity	O/E
Parity select	PAR
Word length	WDL
Baud rate	BR0, BR1, BR2, BR3
Automatic line feed	ALF
Auto wrap around	AWP
Full or half duplex	F/H
Cursor select	CT1, CT0

To set I/O parameters, or to

examine present configuration, the following keys are depressed simultaneously:

Control Shift Enter

The DT-1 will display the current settings in a matrix on the screen as:

TC1	TC0	EM1	EM0	REV	DTR	DSR	OCO
0	0	0	0	0	1	1	0

STB	O/E	PAR	WDL	BR3	BR2	BR1	BR0
0	1	0	0	0	1	0	0

ALF	AWP	F/H	CT1	CT0
0	1	0	0	0

Actual values (zero or one) will vary, depending on what has been stored in the EEPROM. The above values are settings used by personnel at the Radio Shack Computer Center in Glendale, California, to access Compuserve.

All of the available characters in the character generator may be displayed in local mode by pressing shift, escape and V at the same time.

In set-up mode, the cursor may be positioned below the parameters by using the arrow keys and, if required, changes may be made. During set-up, the terminal will only accept a zero or a one. When set-up parameters are configured, the enter key is pressed. The system will display a message asking if values are to be stored permanently. If this is desired, respond with a Y. The screen will respond with a message stating that the set-up has been stored. These settings will remain in memory even if power is turned off. If desired, any character *other than* a Y can be used to respond to the query, in which case the parameters will be implemented, but not stored permanently, and will be lost during a power off.

Emulation modes are determined by the EM0 and EM1 settings. The following are available:

EM1	EM0	
0	0	Televideo 910
0	1	Lear Siegler ADM-5
1	0	ADDS 25
1	1	Hazeltine 1410

Cursor selection is determined by the values assigned to CT1 and CT0.

CT1	CT0	
0	0	Blinking block
0	1	Blinking underline
1	0	Non-blinking block
1	1	Non-blinking underline

In addition to I/O parameters, the DT-1 has a local mode. This allows transmission of control characters and escape sequences to a printer for configuration control, or (as is required by some of the terminals that are emulated as sequence) to turn on the printer or do a keyboard enable. Local mode is accomplished by shift, escape, followed by the sequence or shift control, followed by the control code.

The 65-page manual supplied with the DT-1 is very complete, especially in descriptions of the

codes used in terminal emulation modes. All information necessary to effect special video characteristics (reverse, half intensity), as well as cursor positioning control codes, is given. This completeness will make programmers happy. Detailed instructions on how to interface the DT-1 to Models I, II, III and 16 are included in with this manual. A few typos have slipped into the manual, but these are very obvious, and should not present any problems. By the time this goes to press, Tandy should have errata sheets out for the typos.

Peeking into the vents of the DT-1 indicates the same video board as is used in the Model III. I wish Tandy had used a green phosphor with this terminal. It certainly would have made it a better match for the Model 16. The power supply is located on the bottom behind the panel that hides the disk cutouts. The video board is attached to the top cover on the left.

The balance of the electronics are on a single board, approximately 4 x 10 inches, that lies horizontally at the back. This board also carries two RS-232 connectors and the Centronics compatible printer port. This board is fitted with quick disconnect type of cable connectors that should allow for very rapid servicing in the field. I would estimate that the main board could be replaced in less than thirty minutes. This is an important feature, as it can really minimize down time, which is quite costly if the terminal is used in a business application.

While it's reliability is unknown, one can expect very good performance from the video, as it is the same as the Model III. Modular design of the major subsystems indicates a very short down time if problems do develop. There are some things that I wish Tandy had done differently. One is the lack of a green screen, which would have been a good match for the Model 16. Next, is the placement of the escape key. The escape key is located next to the right shift key. I would have preferred to see this where the tab key is located (next to q). Perhaps I'm just used to having left-hand access to escape and control keys. My final observation is of the parallel printer port. It does have the required eight addresses, strobe and busy, but lacks the ability to check for other printer parameters such as out of paper or end of ribbon.

I would like to acknowledge the help and cooperation of the Radio Shack Computer Center in Glendale, California. They are always willing to provide me with a quiet corner for a couple of hours to pour over new documentation, and are a real help (as in the case of the DT-1) for allowing me an extended session with it. ■

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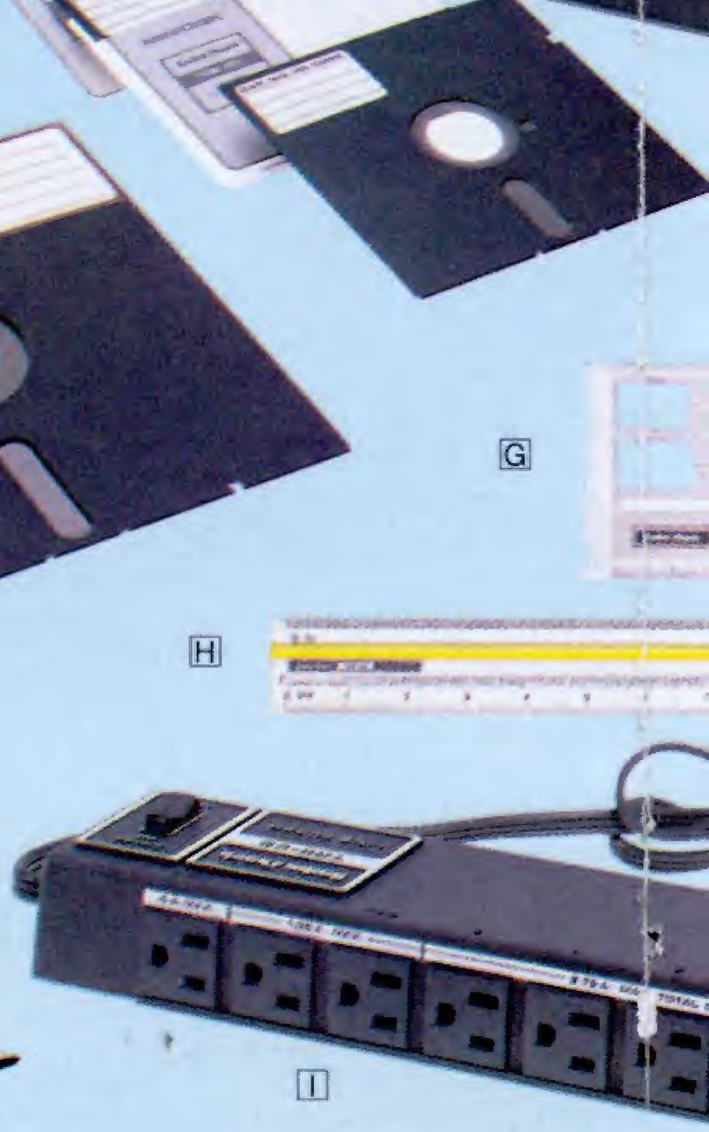

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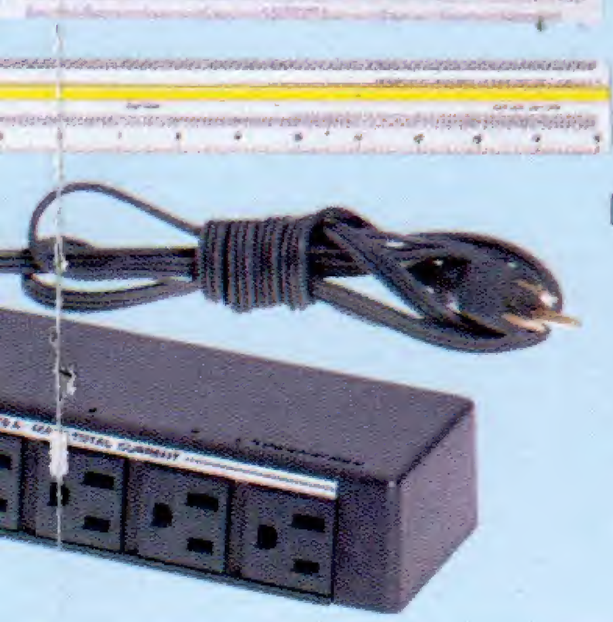

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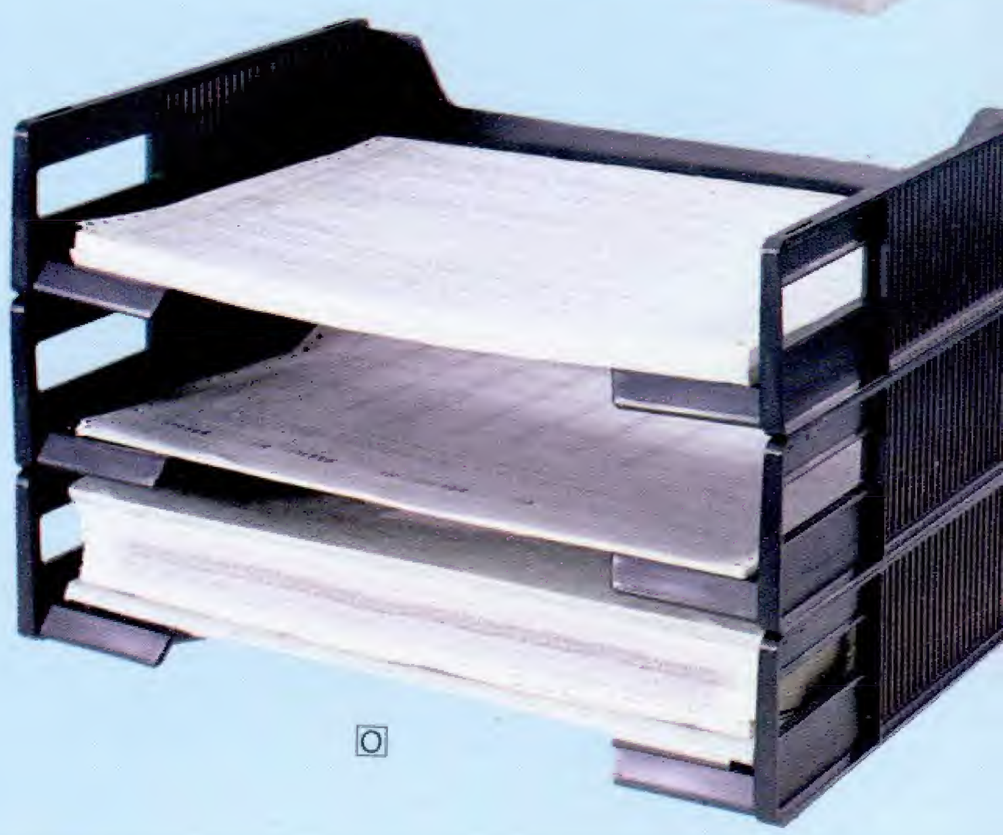

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32

The DUMP command

Find machine language addresses with STAR (system tape address reader)

Model I, 32K with disk

Joe W. Rocke, Ridgecrest, CA

Advantages of the DUMP function included on most disk operating systems (DOS) are probably the least understood of all DOS functions. Properly used, it is one of the simplest, yet most powerful functions available to the user. DUMP can be used to:

Save a system load program from tape to disk.

Link a series of machine code modules into a single program.

Salvage a file lost due to a system 'crash.'

The DUMP Function

The DUMP function is usually included as a DOS library feature. Its purpose is to enable the user to "dump" specified portions of memory contents to disk. The typical useage format is as follows:

DUMP Filespec:d, (START=X 'aaaa', END=X 'eeee', TRA=X 'tttt')

Where "Filespec" is the name assigned to the file to be dumped; "d" is drive number; "aaaa" is memory address for start of the dump; "eeee" is address at which dump is to end; and "tttt" is transfer address (sometimes called entry point) for execution of the filespec if it is a standalone program.

While the actual format will vary with different DOSs, the important factor is use of the memory addresses. These addresses are essential. They specify the portion of memory to be dumped to disk. Should an error be made in specifying the address, the result could be inclusion of extraneous bytes, or absence of bytes vital to the filespec use. In specifying an end address it is better to use a high memory address than too low an address. The extra bytes are usually no problem, whereas a conservative guess at the end may result in a loss of data. If in doubt about a transfer address, use 402D hex which will return control to DOS while leaving the salvaged file intact in memory.

Conventional use of the DUMP function is to save a system load tape program to disk. However, attempts to do so may be a riddle for the user unfamiliar with machine code program structure. The program start, end and transfer address are an absolute must in this application. Unfortunatly, this information is seldom included in program documentation . . . especially if it is a purchased program. Thus, the programmer must use a utility that will provide the needed memory addresses.

The "Reader" program in Sept./Oct. *80-U.S. Journal* is an example of this type of program, except that it does not provide program addresses. For the benefit of readers who do not have a utility which provides system load tape addresses, a system tape address reader (STAR) program listing is included at the end of this article. Only the most expensive DOS provides a utility of this type. Without a suitable tool such as this, the user is left with little alternative other than to use a debug utility and search out the addresses. This can be a frustrating experience unless one is familiar with the debug- or zap-type utilities.

Modular Program Creation

The DUMP function is a dynamic tool for the assembly language programmer. It provides a means for linking individual program modules into one master program. This is especially important when working with a limited random access memory (RAM) capability. In some cases, there is insufficient RAM buffer space available to hold the entire assembly language source code. This leaves the programmer with no choice but to divide the program into modules that can later be linked into a complete program. This operation can be compared to using the Disk BASIC Merge function to link two BASIC programs.

To elaborate on the need for modular construction, let's review the typical editor/assembler. Most

use a minimum system to conserve as much memory space as possible. It must be able to load a file disk, create new files, and maintain a library of user utilities including the assembler. While this may be considered a minimum system, it still requires about 6K of RAM. This leaves a buffer of only 16K for user entry of the source code (assuming a 48K system). While you may never write a 16K assembly language program, the buffer area soon fills if many remarks are used. Fortunately, the DUMP and LOAD functions included in the DOS library provide a way around this limitation.

Using an editor/assembler, one can develop a program as a series of modules, each tailored in length to the buffer space available. Likewise, each can be saved to disk as an individual module. Upon completion of all modules, they can be linked together into a single program. The process of creating the modules can be summarized as follows.

1. Type in source code to the buffer limit.
2. In the first module, EQUate any labels that will be used in subsequent modular segments of the program, or assign a dummy address that can be changed later using a debug.
3. Keep a "crib sheet" of these labels and addresses as they are typed in, for reference or use in subsequent modules.
4. Originate the first module above DOS (i.e., above 5200 hex).
5. Assemble the module, noting the starting and ending addresses on the crib sheet.
6. Save the assembled module to disk as a core memory (/CIM) file.
7. Clear the buffer and continue typing in source code. Use ending address of Module 1 plus one as the ORG (origin) of Module 2.
8. Repeat the foregoing process as many times as necessary to complete the program source code entry.

The end result of this effort is a series of individual (but related) modules. None will function as a standalone program. Linked together, they form a complete program. This is where the DUMP function enters the picture; it is used in the module linking operation.

Linking Modules

To explain the linking of our hypothetical program, we will give the modules a psuedo memory address. For the purpose of illustration, we will use the following addresses. Note that the second module is originated to follow the end address of the first module.

MODULE1/CIM
5300H (origin)
5800H (last of listing)
53FFH (entry point on Module1)

MODULE2/CIM
5801H (1st line)
6ABCH (ending address)

There are several ways these modules could be linked, but we will take the easy way! Using the LOAD and DUMP functions, the procedure is as follows:

1. LOAD MODULE1/CIM <ENTER>
2. LOAD MODULE2/CIM <ENTER>

Note the use of the LOAD command in the foregoing instruction. This, too, is a common library command found in most DOSs. When used from the command mode, it will load a file to memory without causing it to execute. In this case, the LOAD function serves an important purpose. Without it, any attempt to load the modules would result in a sytstem crash. At this point, both modules are in memory, occupying memory locations 5300 hex through 6ABC hex.

The DUMP function is now used to combine the modules. A typical calling format would be as follows:

DUMP MODULE3/CMD:1
(START=X '5300', END=X '6ABC',
TRA=X '53FF')

This will result in dumping the contents of memory from 5300 hex to 6ABC hex onto the disk under the filspec MODULE3/CMD, with the DOS address used as a transfer address.

Modules 1 and 2 remain intact on the disk in their original form and location. MODULE3/CMD is stored at a different location selected by the disk controller. Note use of the /CMD extension when formatting the DUMP statement. As we are assuming this is a standalone program, the CMD extension is required to enable calling the program from DOS. Since Modules 1 and 2 are no longer needed, they may be deleted from the disk directory if desired.

Crash Insurance

The DUMP function can also be used as a basis for salvaging a program in the event of a system crash. To illustrate, let's assume that a system crash occurs as a data file is being created, and system control is restored with a system RESET. Chances are that most of the data in memory when it crashed is still intact. If the file start and end addresses are known, this portion can be saved using the DUMP command. In doing so, the important thing to keep in mind is to assign a new filespec name. This is to prevent over-writing an existing file if the dump is made to the same disk. A new name also serves to identify the salvaged file. The salvaged file can subsequently be examined using a debug or disk modifier utility to restore missing codes, if such action is necessary.

A case in point is salvaging a file when using a word processor program such as PENCIL™ or SCRIPSIT™. In my case, Pencil files have been lost by forgetting to turn the printer on before beginning a printout. (Turning on the printer causes a transient that freezes my keyboard.) In most cases, it is possible to salvage the file using the DUMP function. The general procedure in such cases is as follows:

1. Press the system RESET button (do not power down).
2. DUMP the contents of memory, beginning with the origin of the word processor as the start address, and top of memory as the end address, with transfer to DOS (402D hex).
3. Clear memory and LOAD the CIM file created by the DUMP.

4. Call up your DOS debug, and use it to jump to the origin of the word processor. Both the program and file should be intact.

This manner of salvaging memory contents is especially pertinent to business applications. The best programs and systems are not entirely crash proof. A static discharge, momentary glitch in the powerline, or invalid entry by an inexperienced operator can cause havoc with the best of systems.

While the loss of a Pencil file may not be catastrophic, loss of a business data file can be. Therefore, it behooves anyone who is depending upon computer data files to prepare for possible system crashes. No system is immune to the "if it can happen, it will" part of Murphy's law. Therefore it is wise to observe the scout motto and "be prepared."

This point is illustrated by use of a simplified example:

An inexperienced operator is inputing data to a financial data base file. In the process, the system crashes for reasons left to your imagination. Two hours' work lost, plus possible loss of the original data base! The obvious question is "what to do now?"

The important thing is to save as much of the contents of memory as possible. If steps have been taken

Program Listing for DUMP Command

```
                00010 ;       ..... VERSION 3.1       2/27/82
                00015 ;  BY JOE W. ROCKE .... RIDGECREST, CA  93555
                00020 ;*****************************************************
                00030 ;**   'STAR' - SYSTEM TAPE READER PROGRAM LISTING -   **
                00040 ;*****************************************************
                00050 ;**  UTILITY PROGRAM TO IDENTIFY A CASSETTE TAPE AS   **
                00060 ;**            SYSTEM LOAD OR BASIC FORMAT.           **
                00070 ;**  DISPLAYS START, END & TRANSFER ADDRESS IF TAPE    **
                00080 ;**                IS IN SYSTEM FORMAT.               **
                00090 ;*****************************************************
                00100 ;                       ROM CALLS
                00110 ;=================================================================
06CC            00120 BASIC   EQU   06CCH          ;USE FOR TAPE SYSTEM
402D            00130 DOS     EQU   402DH          ;RETURN FOR DISK SYSTEM
01F8            00140 CASOFF  EQU   01F8H          ;TURN CTR OFF
021E            00150 CASON   EQU   021EH          ;TURN CTR ON
01C9            00160 CLS     EQU   01C9H          ;CLEAR SCREEN FROM ROM
0033            00170 DSP     EQU   0033H          ;DISPLAY BYTE IN REGISTER
28A7            00180 DSMSG   EQU   028A7H         ;DISPLAY MESSAGE ROUTINE
002B            00190 KBD     EQU   002BH          ;KEYBOARD SCAN
0235            00200 READ8   EQU   0235H          ;READ 8 BITS ROUTINE
0296            00210 SYNC    EQU   0296H          ;LOOK FOR SYNC BYTE
000D            00220 CRLF    EQU   0DH            ;CARRIAGE RETURN/LINE FEED
                00230 ;-----------------------------------------------------------------
6000            00240         ORG   6000H          ;CHANGE FOR 32 OR 48K SYS
6000 F3         00250 START   DI                   ;CLOCK OFF FOR 'DOS'
```

beforehand to prepare for such a contingency, the following can be done.

1. Recover system control by means of a reset.

2. Insert a previously formatted file disk in the second disk drive. (Any business system worth its salt will have two drives, right?)

3. Perform a memory DUMP of the entire memory contents above the DOS, to top of memory. For example:
DUMP CRASH/CIM:1,(START=X '5200', END=X 'FFFF', TRA=X '402D') <ENTER>

4. Shut down and wait for the "expert" to return from lunch!

The DUMP will save every byte in memory from 5200 hex (assumed end of DOS) to top of memory (FFFF hex). The DOS entry point, 402DH, was added so the file can be loaded back to memory, followed by a jump to the DOS mode. The "expert" can load the CIM (core image in memory) file to memory using the LOAD command. This will be followed by automatic transfer of system control to the DOS command mode. With the salvaged

```
6001 21003C   00260 START2  LD     HL,3C00H    ;HOME CURSOR
6004 222040   00270         LD     (4020H),HL
6007 CDC901   00280         CALL   CLS         ;CLEAR SCREEN
600A 215661   00290         LD     HL,MSG1     ;GET MSG 1
600D CDA728   00300         CALL   DSMSG       ;DISPLAY IT
6010 CD2B00   00310 SCAN    CALL   KBD         ;BEGIN KEYBOARD SCAN
6013 B7       00320         OR     A
6014 28FA     00330         JR     Z,SCAN
6016 FE0D     00340         CP     0DH         ;CHECK FOR =ENTER=
6018 20F6     00350         JR     NZ,SCAN     ;CONTINUE SCAN IF NEITHER
601A AF       00360         XOR    A           ;MAKE A=0
601B CD1202   00370         CALL   212H        ;DEFINE DRIVE
601E CD9602   00380         CALL   296H        ;FIND SYNC BYTE
6021 214861   00390         LD     HL,MBUFF    ;LOAD BUFFER
6024 0608     00400         LD     B,8         ;8 BYTES TO BUFFER B
6026 CD3502   00410 LP1     CALL   READ8       ;READ 1ST 8 BYTES
6029 77       00420         LD     (HL),A      ;INTO
602A 23       00430         INC    HL          ;MEMORY BUFFER
602B 10F9     00440         DJNZ   LP1         ;LOOP
602D 214861   00450         LD     HL,MBUFF    ;BEGIN TEST
6030 3E55     00460         LD     A,55H       ;CHECK FOR
6032 BE       00470         CP     (HL)        ;SYSTEM HEADER
6033 2838     00480         JR     Z,STEST
6035 3ED3     00490         LD     A,0D3H      ;CHECK FOR
6037 BE       00500         CP     (HL)        ;BASIC HEADER
6038 2817     00510         JR     Z,BTEST
603A CD0D00   00520         CALL   CRLF
603D 21F061   00530 DEFALT  LD     HL,MSG2     ;DEFAULT MSG2
6040 CDA728   00540         CALL   DSMSG       ;DISPLAY MSG 2
6043 ED5B2040 00550         LD     DE,(4020H)  ;DESTINATION
6047 214861   00560         LD     HL,MBUFF    ;SOURCE
604A 010800   00570         LD     BC,8        ;BYTE COUNT
604D EDB0     00580         LDIR               ;XFER DATA
604F 184D     00590         JR     TOFF
6051 23       00600 BTEST   INC    HL          ;TEST FOR 3
6052 BE       00610         CP     (HL)        ;D3'S IN A ROW
6053 20E8     00620         JR     NZ,DEFALT
6055 23       00630         INC    HL          ;DEFAULT IF
6056 BE       00640         CP     (HL)        ;NOT FOUND
```

file back in memory, the memory contents can be examined using a debug utility. In most cases, the majority of information in memory can be salvaged by using debug. To do so, one must have a good knowledge of machine code and debug techniques.

The DUMP function is a useful command when one understands its range of applications. Simply put, it dumps the bytes in memory to disk, creating a core image memory copy of the area specified by the start and end addresses. What one does with this file is dependent upon the imagination, skill and knowledge of the individual.

System Tape Address Reader (STAR)

The STAR program is a utility that will scan a tape-based machine code (system load) program and provide the start, end and transfer addresses in hexidecimal form. This information is necessary in order to dump a tape system load program to disk. The original program name is

```
6057 20E4     00650          JR      NZ,DEFALT       ;
6059 213E62   00660          LD      HL,MSG3         ;BASIC FORMAT MSG
605C CDA728   00670          CALL    DSMSG           ;DISPLAY MSG 3
605F 214B61   00680          LD      HL,MBUFF+3
6062 7E       00690          LD      A,(HL)          ;PRINT THE
6063 CD3300   00700          CALL    DSP             ;FILE NAME
6066 3E22     00710          LD      A,22H           ;CLOSE
6068 CD3300   00720          CALL    DSP             ;
606B 1831     00730          JR      TOFF            ;TURN OFF CASSETTE
606D CD3502   00740 STEST    CALL    READ8           ;READ 8 BYTES
6070 47       00750          LD      B,A             ;COUNT & LOAD
6071 CDC060   00760          CALL    HLADDR          ;START ADDRESS
6074 225061   00770          LD      (STARTA),HL
6077 85       00780          ADD     A,L
6078 4F       00790          LD      C,A
6079 CDC960   00800          CALL    BLOCK
607C CD3502   00810 LOOPD    CALL    READ8           ;READ 8 BYTES
607F FE78     00820          CP      78H             ;CHECK FOR ENTRY
6081 285F     00830          JR      Z,ENDSYS        ;POINT HEADER
6083 FE3C     00840          CP      3CH             ;CHECK FOR START
6085 20F5     00850          JR      NZ,LOOPD        ;OF DATA HEADER
6087 CD3502   00860          CALL    235H            ;
608A 47       00870          LD      B,A             ;BYTE COUNT
608B CDC060   00880          CALL    HLADDR          ;
608E 85       00890          ADD     A,L
608F 4F       00900          LD      C,A
6090 CDC960   00910          CALL    BLOCK
6093 18E7     00920          JR      LOOPD
6095 46       00930 OUTPUT   LD      B,(HL)          ;PRINT A STRING
6096 23       00940          INC     HL              ;OF ASCII CHARACTERS
6097 7E       00950          LD      A,(HL)
6098 CD3300   00960          CALL    DSP             ;DISPLAY BYTES
609B 10F9     00970          DJNZ    OUTPUT+1        ;
609D C9       00980          RET                     ;
609E 212020   00990 TOFF     LD      HL,2020H        ;TURN OFF
60A1 223E3C   01000          LD      (3C3EH),HL      ;BOTH *'S
60A4 CDF801   01010          CALL    CASOFF          ;CASSETTE OFF
```

not important as a user specified name can be used in making the disk dump.

The assembly language source code for STAR is presented in Listing 1. As written, it is structured for CTR tape system operation. The minor changes required for disk system operation are noted in the listing remarks. This program is for a Model I Level II. Minor changes in ROM address calls are required for Model III compatibility.

STAR program application is guided by display prompts. The following steps summarize its use in a tape-based system.

1. Load STAR from the BASIC tape operating mode.
2. Replace the STAR cassette upon completion of the load with the subject tape to be read.
3. Follow the STAR prompts. The program adresses will be displayed upon completion of the "read" operation.
4. Jot down the addresses for future reference.

Do be aware of the fact that STAR may not be able to read some tapes. Programs that include a preloader, or a special copy prevention feature, cannot be read. In such cases, you may as well resign yourself to using these tapes in the normal Level II BASIC mode.

The subject program is not loaded to memory in the reading process. The STAR program only scans the tape, picking out pertinent addresses for display. To save the program to disk using the DUMP command, proceed as follows:

1. Return to DOS mode, and call Disk BASIC mode.
2. Load subject tape to memory using your conventional Disk BASIC tape loading procedure.
3. *Do not* execute the program by typing a slash (/) upon completion of the load.
4. Insert a formated disk in the drive that is to receive the memory dump.
5. Assuming that your DOS permits a DUMP command call from the BASIC mode, type the DUMP call per your DOS instructions. Be sure to add the "/CMD" extension to the filespec name so the program may be called from the DOS command mode.

```
60A7 E5          01020          PUSH    HL
60A8 219162      01030          LD      HL,MSG5          ;"REPEAT" MSG
60AB CDA728      01040          CALL    DSMSG
60AE E1          01050          POP     HL
60AF CD2B00      01060 WAIT     CALL    KBD              ;CALL KBD SCAN
60B2 FE01        01070          CP      01               ;BREAK?
60B4 2807        01080          JR      Z,EXIT           ;EXIT IF YES
60B6 FE0D        01090          CP      0DH              ;ENTER?
60B8 CA0160      01100          JP      Z,START2         ;REPEAT IF <E>
60BB 20F2        01110          JR      NZ,WAIT          ;LOOP IF NEITHER
60BD C3CC06      01120 EXIT     JP      06CCH            ;RETURN TO BASIC
                 01130 ; TURN CLOCK ON (EI) & US 'JP    DOS' FOR DISK
60C0 CD3502      01140 HLADDR   CALL    READ8            ;READ NEXT 2
60C3 6F          01150          LD      L,A             ;BYTES FROM
60C4 CD3502      01160          CALL    READ8            ;TAPE & LOAD
60C7 67          01170          LD      H,A              ;INTO THE HL
60C8 C9          01180          RET                      ;REGISTER
60C9 85          01190 BLOCK    ADD     A,L              ;READS A BLOCK
60CA 4F          01200          LD      C,A              ;OF DATA UP TO
60CB CD3502      01210          CALL    READ8            ;256 BYTES LONG
60CE 23          01220          INC     HL               ;BUMP POINTER
60CF 81          01230          ADD     A,C              ;KEEP CHECKSUM
60D0 4F          01240          LD      C,A              ;IN REGISTER C
60D1 CD2B00      01250          CALL    2BH              ;KEYBOARD SWEEP
60D4 FE01        01260          CP      1                ;STOP ON
60D6 2806        01270          JR      Z,TOFF           ;BREAK
60D8 10F1        01280          DJNZ    BLOCK+2          ;LOOP TILL DONE
60DA CD3502      01290          CALL    READ8            ;
60DD B9          01300          CP      C                ;IS CHECKSUM VALID?
60DE CC2C02      01310          CALL    Z,22CH           ;THEN BLINK '*'
60E1 C9          01320          RET                      ;
60E2 2B          01330 ENDSYS   DEC     HL               ;STORE END ADDRESS
60E3 225261      01340          LD      (ENDA),HL        ;
60E6 CDC060      01350          CALL    HLADDR
60E9 225461      01360          LD      (ENTRYA),HL
60EC 216362      01370          LD      HL,MSG4          ;SYSTEM MESSAGE
60EF CDA728      01380          CALL    28A7H            ;DISPLAY MSG4
60F2 0606        01390          LD      B,6              ;PRINT
60F4 214961      01400          LD      HL,MBUFF+1       ;THE
60F7 7E          01410 LOOPF    LD      A,(HL)           ;FILE
60F8 CD3300      01420          CALL    33H              ;NAME
60FB 23          01430          INC     HL
60FC 10F9        01440          DJNZ    LOOPF            ;DECREMENT B & JR IF B=0
60FE 21BE62      01450          LD      HL,MSG6
6101 CDA728      01460          CALL    28A7H            ;DISPLAY MSG6
6104 2A5061      01470          LD      HL,(STARTA)
6107 CD1F61      01480          CALL    COMPU            ;PRINT START ADDRESS
610A CD2661      01490          CALL    COMMA            ;
610D 2A5261      01500          LD      HL,(ENDA)        ;LOAD END ADDRESS
6110 CD1F61      01510          CALL    COMPU            ;
6113 CD2661      01520          CALL    COMMA
6116 2A5461      01530          LD      HL,(ENTRYA)      ;LOAD ENTRY ADDRESS
6119 CD1F61      01540          CALL    COMPU
611C C39E60      01550          JP      TOFF             ;PREPARE TO TURN OFF CTR
611F 7C          01560 COMPU    LD      A,H              ;WRITES HL REGISTER
6120 CD3161      01570          CALL    OUTHL            ;CONTENTS AS A
6123 7D          01580          LD      A,L              ;HEX ADDRESS
6124 180B        01590          JR      OUTHL            ;
6126 3E2C        01600 COMMA    LD      A,2CH            ;LOAD A ','
6128 CD3300      01610          CALL    33H              ;DISPLAY IT
612B 3E20        01620          LD      A,20H            ;LOAD A 'SPACE'
612D CD3300      01630          CALL    33H              ;AND DISPLAY IT
6130 C9          01640          RET
6131 F5          01650 OUTHL    PUSH    AF
6132 0F          01660          RRCA                     ;SWAP PLACES
6133 0F          01670          RRCA                     ;WITH BITS 0-3
6134 0F          01680          RRCA                     ;AND BITS 4-7
6135 0F          01690          RRCA                     ;
6136 CD3A61      01700          CALL    BIASCI           ;
6139 F1          01710          POP     AF
613A E60F        01720 BIASCI   AND     15               ;CLEAR BITS 4-7
613C FE0A        01730          CP      10               ;JUMP IF A=10
613E 3802        01740          JR      C,NUMBER         ;IF A>9 THEN
6140 C607        01750          ADD     A,7              ;CHANGE TO LETTER
6142 C630        01760 NUMBER   ADD     A,'0'            ;ASCII OFFSET
6144 CD3300      01770          CALL    33H
6147 C9          01780          RET
6148 0000        01790 MBUFF    DEFW    0                ;FIRST 8 BYTES
614A 0000        01800          DEFW    0                ;READ FROM TAPE
```

Address Conflict

While many system load tape programs are compatible with DOS operation, some are not. Programs that load to low memory may displace some DOS functions. At best, these programs will execute with no apparent problems, but may require a reset upon exiting the program. The worst case situation is one whereby the program wipes out the ability to call the DOS DUMP function during the foregoing load and dump sequence. If this should occur, you will not be able to dump the program in memory to disk.

A conflict between DOS and programs that load to low memory may be resolved by changing the program addresses. This requires use of a debug utility, and the expertise needed to accomplish the task. However, if the ability to use a tape-based program on your disk system is the only concern, having to do a reset upon program completion is a small price to pay for fast program accessibility.

```
614C 0000    01810          DEFW    0              ;ARE STORED HERE
614E 0000    01820          DEFW    0
6150 0000    01830 STARTA   DEFW    0              ;STORE START ADDRESS
6152 0000    01840 ENDA     DEFW    0              ;END ADDRESS HERE
6154 0000    01850 ENTRYA   DEFW    0              ;AND ENTRY ADDRESS HERE
             01860 ;------------------ MESSAGE GROUP ------------------
6156 2A      01870 MSG1     DEFM    '**  STAR - SYSTEM TAPE ADDRESS READER  **'
617F 0D      01880          DEFB    0DH
6180 2A      01890          DEFM    '*STAR* READS A 500 BAUD TAPE HEADER '
61A4 0D      01900          DEFB    0DH
61A5 41      01910          DEFM    'AND PRINTS SYSTEM LOAD TAPE ADDRESSES.'
61CB 0D      01920          DEFB    0DH
61CC 0D      01930          DEFB    0DH
61CD 2E      01940          DEFM    '... LOAD TAPE AND HIT =ENTER= ...'
61EE 0D      01950          DEFB    0DH
61EF 00      01960          DEFB    00H            ;END OF MSG1
61F0 54      01970 MSG2     DEFM    'THE HEADER JUST READ WILL NOT LOAD. THE '
6218 0D      01980          DEFB    0DH
6219 46      01990          DEFM    'FIRST 8 BYTES AFTER SYNC CODE ARE: '
623C 0D      02000          DEFB    0DH
623D 00      02010          DEFB    00H            ;END OF MSG2
623E 54      02020 MSG3     DEFM    'TAPE IS IN BASIC FORMAT. USE CLOAD '
6261 0D      02030          DEFB    0DH
6262 00      02040          DEFB    00H            ;END OF MSG3
6263 54      02050 MSG4     DEFM    'TAPE IS MACHINE CODE FORMAT. FILE NAME IS:
6290 00      02060          DEFB    00H
6291 0D      02070 MSG5     DEFB    0DH
6292 3D      02080          DEFM    '=ENTER= TO READ ANOTHER TAPE, ELSE =BREAK= '
62BD 00      02090          DEFB    00H            ;END OF MSG5
62BE 0D      02100 MSG6     DEFB    0DH
62BF 48      02110          DEFM    'HEX START, END & ENTRY ADDRESSES ARE: '
62E5 0D      02120          DEFB    0DH
62E6 00      02130          DEFB    00H            ;END OF MSG6
6000         02140          END     START          ;AUTO START
00000 TOTAL ERRORS
```

Captain 80

The adventures of a software secret agent

"You're two hours late," complained Max as I flipped on the lights to the huge attic computer room that occupies the third floor of Professor Megabyte's palatial Peterborough, New Hampshire mansion. I moved here two months ago to assume the disguise of a mild-mannered software reviewer in hopes of discovering the whereabouts of the missing professor. Max is a sentient computer program residing in an oversized aluminum prototype expansion interface with more bells and whistles than a train station at nine a.m.

"Don't be pushy," I growled, "it's Sunday, and I don't even *work* on Sunday."

"Nonetheless," chided Max, "there are several new programs to review over on the computer desk. So get with it! You're on deadline."

Spectral Associates has been, for several months, advertising a program called Magic Box, which they say will allow you to load and execute BASIC language programs from Model I/III format to the Color Computer. I thought it would be nice to be able to load Spider Mountain into the Color Computer without a lot of typing, so I tried it.

One of the unique (to me) properties of Magic Box is the fact that it loads through the joystick port rather than the cassette port. All of the Model I/III software does likewise. Make sure that you have a 32K Color Computer unless you are loading tiny programs. Nothing commercial will fit symbiotically with Magic Box in 16K.

Included with the program (which *isn't* a box, but which *is* quite magical), is the tape (containing the program), a short input cable interfacing the joystick port to the cassette recorder, and, of course, the instructions. It does work, by the way, assuming there is enough memory to hold both the host and guest programs. I loaded Spider Mountain into the 32K computer and proceeded to begin translating it.

Don't expect miracles. Magic Box does not translate. It merely loads so that *you* can translate. There are some inconsistencies between Extended Color BASIC and Level II BASIC. Still, I enjoyed using it, to the extent a utility can create joy. It is worth its price in time-saving alone. Magic Box is a *must* for a Color Computer owner who likes to tinker with Model I/III software and who knows his language.

"That review was a little dry," commented Max.

"What do you mean *dry*?" I shot back. "There's only so much you can say about utilities. They work or they don't, they cost too much or they don't. Magic Box is priced right and works perfectly. End of case. What's to say?"

Max let out the electronic equivalent of a sigh.

As I sat there in front of the computer, musing about arguing with a computer over magazine article syntax, I was suddenly aware of the strangest feeling. The room melted into a glop of colors, then blended into a gray blur.

"Max!!" I shouted, but it was too late. The program/human interfacing device that had done in Professor Megabyte had now taken hold of me. I'd just been downloaded into the next piece of software in the drive for review.

I closed my eyes, braced myself for impact. The time that Max downloaded me into Zork, I nearly broke my neck in the landing.

When I opened my eyes, I found myself sitting in the sheriff's office, badge on my chest, gun on my hip, staring out into the dusty streets of an old western town. Max had put me in Comp-U-Things' new Challengem program called Time

for the Sheriff, written by Anthony Targonski.

I read the posters on the wall, then gingerly stepped into the street. A tall, menacing figure loomed in front of me, silhouetted in the sun. He moved his arm and my lightning draw cut him down before he could breathe. Blast. It was the undertaker, welcoming me to town.

Shaken, I retired to the saloon for a glass of redeye. Casing the place, I noticed a card game going on. They invited me to join them, so I did. One of the players looked like he was cheating, so I told him so. He turned out to be the mayor and I got thrown out on my ear.

I had taken no more than two steps when three bandits came running out of the bank, guns-a-blazin'. After a running firefight, I arrested them and took them to jail. With the miscreants locked up, I took stock of my situation in the comfort of the sheriff's chair.

Time for the Sheriff is a little simulation. It'll never be a blockbuster by any stretch of the imagination. It's a *good* program in that it works well and entertains the under 12 crowd it is designed for. The closed circuit situations are pat. You may go to the saloon, bank, general store or Indian reservation, shoot it out with any number or combination of bad and good guys.

The door opened and in came the marshall. Would he reward me for a job well done? I felt Max tugging on me from the CPU. The scene melted away and I was once more back home. Aha, Toto! There's no place like home!

Max was contrite.

"I don't know what happened, boss," he sniffled electronically. "One minute you were there, the next, *poof!*" (He still hasn't licked the problem of downloading people into software.) I can see that I have to be much more careful of what I review.

Let's see. The letter begins "Too hot for Radio Shack to handle." Hmmm, must be Bob Krott's new misadventure, Wet Tee-Shirt Contest. Well, I'm ready, Max. Download me. Max? *Max!*

Boy, you just can't depend on some programs when you really need them. Maxxxxxx! ■

Basically BASIC

Input screen control

Model I/II/III and Color Computer

Most of us have been impressed with some of the advanced programs which always have such nice forms on their screens. Using one of them, you almost (remember I said *almost!*) can't make an input mistake because the program very carefully controls where and when you can do input.

If you're like a number of people I've talked to, you probably thought that the technique was difficult to use and very hard to understand. Certainly, to judge from some of the programs that I've seen on the market, there are a large number of "professional" programmers who think so or they would be using the techniques themselves.

Well, it turns out that the techniques themselves are neither mysterious nor hard to master. Just a little work on basic keyboard input techniques along with our knowledge of screen control using the PRINT@, is enough to make very powerful screen input available.

Let's look at three input techniques and see what they can do.

INPUT Statements

The basic form of the input statement is just the keyword INPUT followed by a list of variables that you want to input to. By adding in a string prompt, you can display a line to explain what you want during the input.

For example, we might say:

```
INPUT"AMOUNT";AMT
```

to input the amount of something into the program. This will display the word AMOUNT followed by a question mark (?) on the screen and then wait for you to type a number. Typing a string in response is an error.

One problem with some systems is that when you press enter to complete an input line, the rest of the line is cleared. This isn't so bad for most input situations, but if you already have a form displayed on the screen with more than one input field per line it gets pretty messy.

To see if your system does this, try this simple program:

```
10 CLS:PRINT@0,STRING$(30,"=");

20 PRINT@0,;:INPUT"SOMETHING";A

30 GOTO30
```

This will print a string of 30 "=" signs on the first line of the screen and then ask you to input a number in that space. If the rest of the line disappears, you have this problem. Rather than tell you which models do it and which don't, try it for yourself.

Another fault of the INPUT statement is that no matter what, you *always* get a question mark prompt. What if you want something else? This can also be a strength. You don't have to worry about the prompt and if you ever ask for input, the system will always show a question mark. That makes it easy.

Even more, since INPUT is a normal function in BASIC systems for all computers, programs from other systems are generally easy to use if they use this form of input.

There is one final problem which is critical. Whenever an INPUT sees a "delimiter" (a comma), it stops the variable it is currently inputting and moves to the next. For numbers that's no problem, but if you're trying to input a line of text (say in a text editor) then this becomes more than just troublesome, it becomes impossible.

Still, INPUT is a fundamental statement and still very valuable for general use. For simple programs, you can't go wrong with it.

Line Input

On Model I/III disks systems and all Model IIs and Color Computers, there is a special INPUT statement called LINE INPUT. This was created especially for text line input. It gets rid of the last problem we mentioned above with the comma.

With LINE INPUT, the only thing which stops the input into a variable is the end of line (ENTER key). Because of this, it can only enter one (1) variable. Further, that variable *must* be a string.

The limitation to one string variable is both the strength and the major weakness of LINE INPUT. For its particular purpose, it's hard to beat (but we will). You can prompt with it by including a prompt string like INPUT. Better yet, there's *no question mark!*

LINE INPUT allows you to use whatever you want for a prompt character or nothing at all. Try the same experiment above with LINE INPUT instead of INPUT (remember to replace the variable with a string variable).

LINE INPUT allows you flexibility in dealing with input lines. For example, you could use LINE INPUT to enter a command line including commands and

numbers and so forth and then build a routine into your program which breaks the line up, interprets the commands, and converts the numbers to appropriate variables.

As flexible as it is, LINE INPUT still has some major limitations. You can't control how many characters someone is bringing in, nor can you do special processing if a key is pressed that you want to immediately identify.

Character Input

Still another way to bring things into the computer is to do it one character at a time. Does this sound too slow, or too hard? Well, it isn't if you do it carefully.

The disadvantage of this approach is that you lose all the special abilities of normal INPUT or LINE INPUT routines. But this is also its major advantage. If you want special controls, you put them in. If you don't want them you leave them out.

If you want the ability to limit the length of a line, you can program that in. If you want to put a field size on the screen, you can. If you want to keep certain characters out of your line, you can do that also. In short, it's up to you what to include and what to leave out.

The key to individual character input is to be able to get individual characters and control them. Sounds obvious right? But there's a catch, how do we do it?

TRS-80 BASIC provides us with a simple-to-use solution, INKEY$. INKEY$ is a BASIC function which takes a look at the keyboard any time it's called and returns a character if it finds one pressed and nothing otherwise.

To use INKEY$, we need a character entry subroutine that we can call anytime we want a character from the keyboard. A general one looks like this:

```
500 REM - - - - - CHARACTER ENTRY - - - - - - - - - -

510 C$=INKEY$:IF C$="" THEN 510

520 RETURN
```

In line 510, we look for a character at the keyboard (C$=INKEY$). If we don't find one (C$="") then we keep looking, otherwise, we return (line 520).

To use this, we have a Line Input routine that gets characters and makes them available to our program. Let's say that we will return the characters we type into string IN$, then the line input routine would look like this:

```
600 REM - - - - - LINE INPUT - - - - - - - - - - - - -

610 IN$=""

620 GOSUB500: IF ASC(C$)=13 THEN RETURN

630 IF ASC(C$)=8 THEN IF LEN(IN$)>0 THEN
PRINTCHR$(8);: IN$=MID$(IN$,1,LEN(IN$)-1):
GOTO620 ELSE 620

640 IF LEN(IN$)>=ZF THEN 620
```

```
650 IF ASC(C$)<32 THEN 620

660 IN$=IN$+C$:PRINTC$;:GOTO620
```

The routine works like this:

1. In line 610, we erase the string we're going to fill with characters.

2. Now we get a character (GOSUB500) and look to see if it's the ENTER key (ASC(C$)=13). If it is, we're done and so we go back to wherever the routine was called.

3. Next we check to see if what was pressed was the backspace key (ASC(C$)=8). If there are characters in IN$ (LEN(IN$)>0) then we backspace on the screen (PRINTCHR$(8);) and get rid of the last character in IN$ (IN$=MID$(IN$,1,LEN(IN$)-1)). Then we look for another character. If there were no characters in IN$, then we just go back to get another character and ignore this one.

4. If we have ZF characters already in IN$ (this will be set when we call the routine) then we ignore the character just typed.

5. If the character is a special code (ASC(C$)<32), we ignore it as well.

6. If we made it through all the tests, then we add it to the string (IN$=IN$+C$) and print it on the screen (PRINT C$;). Notice the semicolon (";") after the print, this prevents each print from putting the next character on a new line.

Now that we have a routine to input characters and make lines out of them, we can input anything we want. Admittedly, this isn't going to be as fast as using a regular INPUT or LINE INPUT which works in machine language. But how many of you can type fast enough to outstrip it?

The program included with this installment demonstrates the three types of input. Try it, you may find some ideas for your next program.

Program Listing for Basically BASIC

```
1Ø REM ******************************
2Ø REM
3Ø REM  SCREEN CONTROL INPUT
4Ø REM  TERRY R. DETTMANN
5Ø REM
6Ø REM  VERSION 1.Ø   Ø5/Ø1/82
7Ø REM
8Ø REM
9Ø REM ******************************
95 REM          CLEAR STRING SPACE FOR
INPUT AND SET LINE LENGTH FOR SCREEN
1ØØ CLEAR1ØØØ:LL=8Ø:REM  LL=8Ø MOD II,
64 MOD I/III, 32 COLOR COMPUTER
1Ø5 REM         DA$ WILL BE THE DATA AR
RAY
1Ø6 REM         PM$ IS THE ARRAY OF PRO
MPTS FOR DATA
1Ø7 REM         LC IS THE SCREEN LOCATI
ON TO PUT THE PROMPT
```

```
108 REM          LF IS THE SCREEN LOCATI
ON TO PUT THE INPUT FIELD
109 REM          FL IS THE FIELD LENGTH
(NUMBER OF CHARACTERS) IN THE INPUT
110 DIM DA$(10),PM$(10),LC(10),LF(10),F
L(10)
115 REM          READ IN THE PROMPTS AND
 FIELD LOCATIONS
120 FORI=1TO10:READ PM$(I),FL(I),CA,CB,
FA,FB
125 REM          CA & CB ARE THE ROW AND
 COLUMN POSITION, THIS IS CONVERTED
126 REM          TO LC FOR THE PROMPT LO
CATION. FA & FB ARE THE ROW & COLUMN
127 REM          POSITIONS FOR THE INPUT
 FIELD
130 LC(I)=CA*LL+CB:LF(I)=FA*LL+FB
140 NEXTI
200 REM - - - - - - - - - - - COMMAND LOO
P - - - - - - - - - - - - - - - - -
205 REM          EVERY PROGRAM NEEDS A M
ENU DOESN'T IT????
210 CLS:PRINT"DATA ENTRY SCREEN DEMONST
RATION"
220 PRINT:PRINT
230 PRINTTAB(10)"1.   USING INPUT STATE
MENT"
240 PRINTTAB(10)"2.   USING LINE INPUT"
250 PRINTTAB(10)"3.   USING CHARACTER I
NPUT"
260 PRINT:PRINT
270 INPUT"SELECTION";S
275 REM          CHECK FOR LEGAL SELECTI
ON
280 IF S<1 OR S>3 THEN 200
285 REM          EXECUTE SELECTION
290 ON S GOSUB 2000,2100,2200
300 GOTO200

500 REM - - - - - - - - - - - PRINT SCREE
N - - - - - - - - - - - - - - - - -
505 REM          BY DEFINING THE PROMPTS
 IN ARRAYS, WE CAN SIMPLY LOOP OVER
506 REM          THEM EASILY WITHOUT ALO
T OF TYPING, AFTER ALL, I'M
507 REM          BASICALLY LAZY
510 FORI=1TO10:PRINT@LC(I),PM$(I);:PRIN
T@LF(I),STRING$(FLD(I),".");
520 NEXTI:RETURN
900 REM - - - - - - - - - - SCREEN DATA
 - - - - - - - - - - - - - - - - -
905 REM          STORED IN THE ORDER NEE
DED BY THE READ STATEMENT
906 REM          ONE DATA STATEMENT PER
DATA LINE TO ENTER
907 REM          THIS STRUCTURE IS FOR T
HE PROGRAMMER'S CONVIENIENCE
```

```
908 REM          IT MAKES IT EASIER TO C
HANGE FIELDS AROUND LATER
910 DATA NAME1,20,3,0,3,10
920 DATA NAME2,20,4,0,4,10
930 DATA ADDRESS,20,6,0,6,10
940 DATA CITY,20,7,0,7,10
950 DATA STATE,2,8,0,8,10
960 DATA ZIP,9,9,0,9,10
970 DATA PHONE,12,10,0,10,10
980 DATA BIRTHDAY,8,12,0,12,10
990 DATA ANNIV,8,13,0,13,10
1000 DATA MISC,20,14,0,14,10
2000 REM - - - - - - - - - - INPUT STAT
EMENT ENTRY - - - - - - - - - -
2010 CLS:PRINT"INPUT FORM DATA ENTRY":G
OSUB500
2015 REM         NOTICE THAT THE POSITIO
N TO START THE INPUT IS
2016 REM         2 SPACES LEFT OF THE IN
PUT FIELD, ROOM FOR A
2017 REM         QUESTION MARK (?) AND A
 SPACE
2020 FORI=1TO10:X=LF(I)-2
2030 PRINT@X,;:INPUTDA$(I):PRINT@X," ";
2040 NEXTI
2050 RETURN
```



```
2100 REM - - - - - - - - - - LINE INPUT
 ENTRY - - - - - - - - - - - - -
2110 CLS:PRINT"LINE INPUT DATA ENTRY":G
OSUB500
2120 FORI=1TO10:X=LF(I)-1
2125 REM         WITH LINE INPUT, THERE
IS NO PROMPT UNLESS YOU PUT IT THERE
2130 PRINT@X,">";:LINE INPUTDA$(I):PRIN
T@X," ";
2140 NEXTI
2150 RETURN
2200 REM - - - - - - - - - - CHARACTER
ENTRY - - - - - - - - - - - - -
2210 CLS:PRINT"CHARACTER INPUT DATA ENT
RY":GOSUB500
2215 REM         HERE I'VE ALLOWED A 2 S
PACE PROMPT THAT LOOKS LIKE AN ARROW
2220 FORI=1TO10:X=LF(I)-2
2225 REM         IT'S IMPORTANT TO CLEAR
 THE STRING BEFORE CALLING
2226 REM         THIS ENTRY ROUTINE (OR
CLEAR IT THERE)
2230 PRINT@X,"=>";:DA$(I)="":GOSUB2300:
PRINT@X,"  ";
2240 NEXTI
2250 RETURN
2300 REM - - - - - - - - - - READ A LINE
CHARACTER BY CHARACTER - - - - - -
2305 REM         GET A SINGLE CHARACTER
2310 GOSUB2400
2315 REM         IS IT IS <ENTER> THEN W
E'RE DONE SO RETURN
2320 IF ASC(C$)=13 THEN RETURN
2325 REM         IF IT  IS BACK-SPACE TH
EN CHECK THE STRING TO SEE IF
2326 REM         IT HAS ANYTHING IN IT Y
ET, IF  IT DOES, THEN REMOVE ONE
2327 REM         CHARACTER FROM THE STRI
NG AND FROM THE SCREEN
2330 IF ASC(C$)=8 THEN IF LEN(DA$(I))>0
 THEN DA$(I)=MID$(DA$(I),1,LEN(DA$(I))-
1):PRINTC$;:GOTO2300
2335 REM         LIMIT THE STRING TO A M
AXIMUM OF THE FIELD LENGTH
2340 IF LEN(DA$(I))>=FLD(I) THEN 2300
2345 REM         IGNORE ALL SPECIAL CHAR
ACTERS
2350 IF ASC(C$)<32 THEN 2300
2355 REM         IF IT FINALLY PASSES AL
L THE TESTS, ADD IT TO THE STRING
2356 REM         AND PRINT IT (NOTICE TH
E SEMI-COLON ';')
2360 DA$(I)=DA$(I)+C$:PRINTC$;:GOTO2300
2400 REM - - - - - - - - GET A SINGLE C
HARACTER - - - - - - - - - - - -
2410 C$=INKEY$:IFC$=""THEN2410 ELSE RET
URN
```

■

Microcomputers for a California high school

Dan Robinson, Pacifica, CA

California's Proposition Thirteen hit the state's computer projects like an earthquake, but some schools are learning to cope with the fiscal disaster through self help.

Proposition Thirteen severely curtailed the property taxes that support local schools, barely leaving enough funds to provide for existing programs. There were none at all for such new and expensive projects as computer instruction courses.

Terra Nova High School in Pacifica, California (on the fringes of San Francisco), is one school where the students have raised the funds which the tax collectors could not. When the public purse snapped shut, the school had four TRS-80s. At the end of the last school year, they were up to nine and growing.

The users of the Terra Nova computers were members of the school's Math Club. They reddened their knuckles knocking on doors throughout the community selling candy bars and collecting aluminum cans to raise funds. They raised money on campus by selling their personalized, computer-printed Terra Nova calendar, complete with the TN Tiger.

This year, the students plan to box up their computers and join the community's elementary school carnivals. They'll bring along an array of arcade games to cash in on that two-bits-a-game craze, and expect to net between $50-$100 for each of the dozen carnivals in the district.

Last year, the Math Club invested in a coffee urn and supplies to establish a navy-style coffee mess in the faculty room. Even at a reasonable fifteen cents per cup, the coffee sales netted enough last year to provide one more computer for the school.

A program written to overcome a common problem was made into an article for a computer magazine, together with an offer to provide the utility on disk at a reasonable price. Sales, so far, have been sufficient to add a disk drive to the school's system.

Club members are now writing scoring programs for the school's athletic events. They hope to tap the Booster Club's treasury by providing computer services at the games.

At the same time that the students were raising funds, they were exploring means to expand their systems. It was discovered that a company was replacing their old Selectric-type terminals, and the company was pursuaded to sell eight of the machines to the school at a token price. Their maintenance technicians volunteered the time to show the students how to interface the units to the computers as printers. The business community was canvassed. One business donated a computer, the others some needed software.

With nine computers up and operating, Terra Nova was able to schedule computer classes this year — the first high school in the district to do so. With this, district officials have begun to take the computer project seriously and have promised that, somehow, they will find the funds to keep the project not only going, but growing.

Proposition Thirteen shook California's computer projects severely. But from it, the students have learned that they can pull themselves up pretty high by their own bootstraps. ■

Checkbook

Part III: Space saving with NEWDOS/80

Model I/III

Jerry L. Latham, Midwest City, OK

We are at the end of this three-part series and are ready for the final two program modules which will make our checkbook management package work smoothly for us. You will see some interesting things you can do when you combine the NEWDOS/80 command RUN"filename",V with the runtime DELETE command. We will also take another look at the CMD"O" method of sorting arrays.

With just a little pre-planning, you should be able to come up with some other uses for the technique you are about to see. Because the use of the NEWDOS/80 command RUN"filename",V passes all variables to the file named, you may pass parameters to the new program that is to be run. This really isn't much different than what we have been doing for the last two months. But, up until now, we really haven't cared what choice was made in the MENU program to get us to the program currently in memory. This time we will be. MENU gave us six program options, and you may remember that there were only four different program names mentioned in the list. BUILDALL and FIXSERCH were both called twice. The listings and the explanations that follow should show how NEWDOS/80's runtime options for passing variables and deleting program lines can actually turn one program into two or more different programs. If you can store two (or more) similar programs, where you formerly stored those two, three or four programs on disk, then you have saved yourself that much disk space.

Listing 1 shows the program called BUILDALL. This program's only purpose is to take all of the monthly statement files and turn them into one big file so that we can use it to obtain long-term data. The two choices for building these composite files are to build them with, or without, your outstanding bank transactions. By checking at the start of the program and asking which choice was made in the MENU selection, you may choose to delete, or not to delete, the one-item data statement in the files program which contains the name of the file storing those outstanding items. In this case, we only delete one line, but just as easily could have deleted many more. That one line is the only difference in the two programs. By not having to keep both programs separately on disk, you have immediately saved about 3 grans, 1½ tracks, or the equivalent of 3840 bytes of disk storage.

The operation of "both" of these programs is relatively easy. You supply the name that you want the composite file to have (this can either be an existing file or a new one). If the file already exists, its contents will be written over, as we are using the OPEN"O" command and not the OPEN"E" command here. You also are given the option to include all files listed in the data base, or to select from them, as the program runs. If you decide to be selective, you will have to babysit the program to pick and choose. Normally, you should let the program run on "auto-pilot" and build a file from all files listed in the data base. This requires no more attention from the operator. If you decided not to include all files in the composite file, you can bet that the balance shown for that composite file will *not* be correct.

When we set up the transaction description array, I told you that the first item (element zero) of the array should be "BAL FWD". Now you will see why. After all chosen files are read, the composite file is sorted by type transaction code, which places all "BAL FWD" items together at the beginning of the file. Next, a pointer moves through the array to find the first non-zero item. It is the data from that first non-zero item, to the last item, that is written into the composite data file. This is also the reason that the deposit you used to open your account should be shown as a deposit and not as a "BAL FWD" type transaction.

If you elected to only use two files for your records (one for outstanding items and one for all cancelled items),

there is really no need for you to keep BUILDALL on your disk. Options 5 and 6 could be deleted from the MENU.

Drum roll please — and trumpets. Here is the program module you have been waiting for (even if you didn't know it). Listing 2 shows FIXSERCH. By far the longest program, it is also the hardest working of the four major modules. FIXSERCH allows you to quickly correct or change any piece of data in any file. But that is not its major strength.

FIXSERCH makes extensive use of the CMD"O" command to allow searching files for a particular transaction, or for a group of related transactions. You can search for one particular check or deposit, or search for all checks in the file that were used to make you car payments, or to pay your doctor. You could search for all deposits that were, for example, in excess of $100.00. The versatility of this routine is not bad. It could be better, but for now it is not bad. Notice that if you chose the search option from MENU, all lines referring to correction of data are deleted before the run really begins. By allowing this module to double as two that would need much the same coding, we have saved seven grans, or three and one-half tracks of disk space. Combined with what we saved with BUILDALL, that is five tracks saved. If you figure what you probably saved by having DATEIN, DATEOUT, PRINTCK and FILES on the disk only once, you have saved about seven tracks of space. That is room for another program the size of FIXSERCH!

In order to achieve the flexibility needed for this module, I found that the CMD"O" command of NEWDOS/80 was invaluable. Unless you have some other enhanced operating system, such as ENHBAS or INFINITE BASIC, machine code sorts are probably not readily available to you, especially sorts that handle several arrays at once. BASIC itself would be impossibly slow for this job. With this function, we can change method of search in a jiffy, and get all the versatility we need.

Notice when a sort is done with the CMD"O" command, all associated arrays are sorted at the same time. This is necessary to keep all of the data together. The variable X is always used as the maximum number of items to sort. That keeps us from including null elements of the array in the sort. Zero is always used as the starting element in all arrays to assure that all elements of the arrays are considered in the sort. Immediately following each sort routine, is the search routine that finds the item or items you want to see. These are binary searches. Even when searching through a full 1501-element array, you will never have to "look" at over eleven elements to find the item, or to decide that the item doesn't exist in the array being searched.

Just a few random comments before finishing. There are some disadvantages to using DELETE in your programs. If you choose to delete introductory lines from your program, you may not RUN the program again in BASIC. To run from scratch, you must use the RUN"filename" command. You may, of course, stop

program execution and use a GOTO to pick up the program wherever you want. Although I didn't go into it in the main part of the article, you may have noticed that some program lines were deleted, based on either the detected absence of a printer, or the response "N" to the ". . . HARDCOPY . . ." query.

The lines actually deleted contained the actual LPRINT statements. If they are no longer in the program, you certainly don't have to worry about hanging up the computer trying to do the impossible. This way, you don't have to set a flag to jump around LPRINT statements. Just check once, and press on with the program. All of the listings were typed with extra spaces for ease of reading. To save more space in memory, and on disk, load each program module or routine into the computer and give the CMD"C" command. This will remove all extra spaces and REMarks. All parts of this program will run after this operation has been done. Of course, you should save the compressed program back to disk with its same filename.

That about winds it up. I hope that you feel you have learned something from this series, and that the example program package was a good one. I have intentionally been brief in my description of the inner workings of the program so that we could focus on using the operating system rather than the program.

For those who would like more detailed information on the operation of the program, send me $2.00. If you got lost typing in the program and would like a full operating version (with some enhancements that didn't fit into the article), send $15.00 and you get a non-system diskette with all of the program on it, a complete listing, and the operating instructions. J. L. Latham, 1409 Evergreen Cir., Midwest City, OK 73110.

Listing 1
Checkbook

```
4000 REM          PROPERTY OF:
JERRY L. LATHAM
1409 EVERGREEN CIRCLE
MIDWEST CITY, OK  73110

4010 CLS:PRINTTAB(18)"CHECKBOOK 1.0":PR
  INTTAB(21)"BUILDALL":PRINT:PRINT"INIT
  IATING":IFPEEK(&H6818)<>205THENRUN"ME
  NU"
4020 PRINT"MERGING DATEOUT":MERGE"DATEO
  UT"
4030 PRINT"MERGING FILE DATA":MERGE"FIL
  ES"
4040 IFA$=5THENCMD"F",DELETE1201O
4050 IFPEEK(14312)=255THENA="N"GOTO4100

4060 PRINT"DO YOU REQUIRE HARDCOPY OF T
  HE RESULTS (Y/N)? ";:GOSUB4430:IFA="N
  "THEN4100
4070 PRINT"CHECKING PRINTER STATUS":MER
  GE"PRINTCK"
4080 GOSUB11000
4090 CMD"F",DELETE11000-11080
4100 IFA="N"THENCMD"F",DELETE4320-4380
4110 CMD"F",DELETE4010-4110
4120 IFAF<>""THENPRINT"FILENAME IN USE
  IS ";AF;"
DO YOU WISH TO CONTINUE USING THIS FILE
   AS THE
OUTPUT FILE FOR THE COMPOSITE FILE (Y/N
  )? ";:GOSUB4430:IFA="N"THENGOTO4160
4130 AF="":PRINT:INPUT"ENTER FILENAME T
  O WORK WITH (/DAT:1 EXTENSION WILL BE
   ADDED)
FILENAME ";AF:P=USR0(VARPTR(AF))
4140 IFLEN(AF)<1ORLEN(AF)>8ORLEFT$(AF,1
  )<"A"ORLEFT$(AF,1)>"Z"THENPRINT"INVAL
  ID FILENAME, RE-ENTER.":GOTO4130
4150 AF=AF+"/DAT:1"
4160 PRINT"DO YOU WANT ALL FILES IN THE
   DATA LIST INCLUDED?  IF NOT, THEN  Y
  OU MUST BE PRESENT TO CONTROL WHICH F
  ILES ARE INCLUDED.
REPLY  Y OR N ";:GOSUB4430:PC=0:IFA="Y"
  THENPC=1
4170 RESTORE:CLS:PRINT"BEGINNING BUILDI
  NG OF FILE ";AF
```

```
4180 READB:IFB="LAST"THENCLOSE1:GOTO427
  Ø
4190 IFPC=1THEN4210
4200 PRINT"DO YOU WANT FILE "B" INCLUDE
  D IN THE OUTPUT FILE (Y/N/E)?";:GOSUB
  4430:IFA="N"THEN4180ELSEIFA="E"THEN42
  5Ø
4210 PRINT"READING DATA IN FROM FILE ";
  B
4220 CLOSE:OPEN"I",1,B
4230 IFLOC(1)$=-1THEN4250
4240 INPUT#1,WT(X),DA(X),ZD(X),TY(X):X=
  X+1:GOTO4230
4250 X=X-1:CLOSE1:PRINT"DATA READ SUCCE
  SSFULLY FROM FILE ";B
4260 GOTO4180
4270 PRINT"ALL DATA FILES READ.  PREPAR
  ING FOR DATA SORT.":FORY=ØTOX:SZ(Y)=S
  GN(WT(Y)):WT(Y)=ABS(WT(Y)):DA(Y)=ABS(
  DA(Y)):ZD(Y)=ABS(ZD(Y)):NEXTY:PRINT"S
  ORT PREPARATION COMPLETED."
4280 PRINT"NOW SORTING ALL INPUT DATA":
  CMD"O",X+1,TY(Ø),DA(Ø),ZD(Ø),WT(Ø),SZ
  (Ø):PRINT"DATA SORTED. NOW CHECKING F
  OR BALANCE FOREWARD VALUES.":Y2=Ø:FOR
  Y=ØTOX:IFTY(Y)=ØTHENY2=Y2+1:NEXTYELSE
  NEXTY
4290 PRINT"DATA SORTED, BALANCE FOREWAR
  D VALUES REMOVED. PREPARING FOR SAVE.
  ":FORY=ØTOX:WT(Y)=WT(Y)*SZ(Y):DA(Y)=D
  A(Y)*SZ(Y):ZD(Y)=ZD(Y)*SZ(Y):NEXTY:PR
  INT"SAVING DATA IN FILE ";AF:CLOSE:OP
  EN"O",1,AF
4300 FORY=Y2TOX:PRINT#1,WT(Y);DA(Y);ZD(
  Y);TY(Y);:NEXTY:CLOSE
4310 PRINT"DATA NOW ON FILE IN FILENAME
    ";AF
4320 LPRINT"ITEM/NUMBER";TAB(15);"DATE"
  ;TAB(30);"DESCRIPTION";TAB(50)"AMOUNT
  ";TAB(62);"BALANCE";TAB(75);"AR #"
4330 DB=Ø:A1="$##,###.##":FORY=Y2TOX:ZD
  =ABS(ZD(Y)):GOSUB10150
4340 IFABS(WT(Y))=1THENAC="DEPOSIT":GOT
  O437Ø
4350 IFABS(WT(Y))=32767THENAC="SVC CHAR
  GE":GOTO437Ø
4360 AC=STR$(ABS(WT(Y))
```

```
4370 DB=DB+DA(Y):LPRINTAC;TAB(15);AD;TA
  B(30);BT(TY(Y));TAB(50);"";:LPRINTUSI
  NGA1;DA(Y);:LPRINTTAB(62);"";:LPRINTU
  SINGA1;DB;:LPRINTTAB(75)Y
4380 NEXTY
4390 IFDB=0THENPRINT"COMPUTING BALANCE"
  :FORY=Y2TOX:DB=DB+DA(Y):NEXTY
4400 PRINTUSING"BALANCE IS  $##,###.##"
  ;DB
4410 CLOSE:PRINT"PRESS ENTER TO RETURN
  TO MENU";
4420 A=INKEY$:IFA<>CHR$(13)THEN4420ELSE
  RUN"MENU",V
4430 A=INKEY$:IFA=""THEN4430ELSEP=VARPT
  R(A)):IFA<>"N"ANDA<>"Y"ANDA<>"E"THEN4
  430ELSEPRINTA:RETURN
```

Listing 2
Checkbook

```
FIXSERCH
5000 REM        PROPERTY OF:
JERRY L. LATHAM
1409 EVERGREEN CIRCLE
MIDWEST CITY, OK  73110
```



```
5010 CLS:PRINTTAB(18)"CHECKBOOK  1.0":P
  RINTTAB(21)"FIXSERCH":PRINT:PRINT"INI
  TIALIZING":SC=0:IFPEEK(&H6818)<>205TH
  ENRUN"MENU"
5020 PRINT"MERGING DATEIN":MERGE"DATEIN
  "
5030 PRINT"MERGING DATEOUT":MERGE"DATEO
  UT"
5040 IFPEEK(14312)=255THENGOTO5080ELSEP
  RINT"DO YOU REQUIRE HARDCOPY OF THE R
  ESULTS (Y/N)? ";:GOSUB6280:IFA="N"THE
  NGOTO5070
5050 PRINT"CHECKING PRINTER STATUS":MER
  GE"PRINTCK"
5060 GOSUB11000:CMD"F",DELETE11000-1108
  0
5070 IFA="N"THENCMD"F",DELETE6220-6260
5080 IFA%=3THENCMD"F",DELETE6080-6230
5090 A="":IFAF<>""THENPRINT"FILE IN USE
   IS ";AF;"
DO YOU WISH TO EXAMINE/CORRECT DATA IN
  THIS FILE (Y/N)? ";:GOSUB6280
5100 CMD"F",DELETE5010-5100
5110 IFA="Y"THEN5190
5120 ONERRORGOTO6300:Y=0:X=1500:SC=0:AF
  ="":INPUT"ENTER FILENAME FOR INPUT FI
  LE (/DAT:1 EXTENSION WILL BE ADDED)
INPUT FILENAME ";AF:P=USR0(VARPTR(AF))
5130 IFLEN(AF)<1ORLEN(AF)>8ORLEFT$(AF,1
  )<"A"ORLEFT$(AF,1)>"Z"THENPRINT"INVAL
  ID FILENAME, RE-ENTER.":GOTO5120
5140 AF=AF+"/DAT:1"
5150 Y=0:CLOSE:OPEN"I",1,AF:ONERRORGOTO
  0:CLS:PRINT"LOADING DATA ITEM       FR
  OM FILE ";AF;
5160 IFLOC(1)$=-1THEN5180ELSEPRINT@18,Y
  ;
5170 INPUT#1,WT(Y),DA(Y),ZD(Y),TY(Y):Y=
  Y+1:GOTO5160
5180 CLOSE:PRINT:PRINTY;"ITEMS LOADED S
  UCCESSFULLY. FILE CLOSED.":X=Y-1:Y=0:
  PRINT"PREPARING DATA FOR SEARCHES. ST
  AND BY."
5190 FORY=0TOX:PRINT@62,"**";:SZ(Y)=SGN
  (WT(Y)):WT(Y)=ABS(WT(Y)):DA(Y)=ABS(DA
  (Y)):ZD(Y)=ABS(ZD(Y)):PRINT@62,"* ";:
  NEXTY:CLS:PRINT:PRINT"PRE-SEARCH ORGA
  NIZATION COMPLETED.":FORY=0TO1000:NEX
  TY:CLS
5200 PRINT"HOW DO YOU WISH TO SEARCH FO
  R ITEMS:
1) NO SEARCH-RETURN TO MAIN MENU
2) EXAMINE ANOTHER FILE
3) SEARCH BY NUMBER/TYPE OF ITEM
4) BY DATES
5) BY DESCRIPTION
6) BY AMOUNT"
```

```
5210 PRINT"7) NO SEARCH-GET BALANCE OF
  THIS FILE

ENTER YOUR CHOICE (1-7) ";
5220 A=INKEY$:IFA<"1"ORA>"7"THEN5220ELS
  EPRINTA:YQ=VAL(A):ONYQGOTO5230,5300,5
  320,5520,5680,5840,6340
5230 IFCH%=0ANDYQ=2THEN5120ELSEIFCH%=0A
  NDYQ=1THENCLOSE:RUN"MENU",V
5240 PRINTCH%;"CHANGES HAVE BEEN MADE T
  O THIS FILE. SAVE IT (Y/N)?";:GOSUB62
  80:IFA="N"THENCH%=0:GOTO5230
5250 PRINT"SAVING REVISED FILE ";AF:CLO
  SE:CMD"O",X,ZD(0),WT(0),DA(0),TY(0),S
  Z(0)
5260 FORY=0TOX:ZD(Y)=ZD(Y)*SZ(Y):WT(Y)=
  WT(Y)*SZ(Y):DA(Y)=DA(Y)*SZ(Y):NEXTY:O
  PEN"O",1,AF
5270 FORY=0TOX:PRINT#1,WT(Y);DA(Y);ZD(Y
  );TY(Y);:NEXTY:PRINT"FILE SAVED.":CLO
  SE:PRINT"FILE CLOSED.":CH%=0
5280 IFYQ=1THEN5230
5290 GOTO5120
5300 IFCH%=0THEN5120
5310 GOTO5240
5320 GOSUB6290:PRINT"ENTER CHECK NUMBER
  , OR
"A9"DEP"A9" OR
"A9"SC"A9"
ENTER CHOICE ";:INPUTAL:P=USR0(VARPTR(A
  L)):IFAL="END"THENCLS:GOTO5200
5330 IFAL="DEP"THENTS=1:GOTO5420
5340 IFAL="SC"THENTS=32767:GOTO5420
5350 TS=VAL(AL)+1:IFTS<2THENPRINT"CHECK
   NUMBER ";AL;" CANNOT EXIST.":GOTO532
  0
5360 IFSC<>1THENPRINT"SORTING FOR SEARC
  H.":CMD"O",X+1,WT(0),DA(0),ZD(0),TY(0
  ),SZ(0):SC=1:PRINT"SORT COMPLETED."
5370 PRINT"SEEKING ITEM # ";AL:GOSUB641
  0
5380 PM=(PH-PL)/2+PL:IFTS=WT(PM)THENGOS
  UB6020:GOTO5320
5390 IF((PL+PH)=PC)OR(PM<=PB)OR(PM>=PT)
  THENCLS:PRINT"ITEM ";AL;" NOT FOUND I
  N FILE ";AF:GOTO5320
5400 PC=PL+PH:IFWT(PM)>TSTHENPH=PM:GOTO
  5380
5410 PL=PM:GOTO5380
5420 INPUT"ENTER DATE OF ITEM TO SEEK (
  MM/DD/YY)";AD:GOSUB10000
5430 IFTS=1THENINPUT"ENTER AMOUNT OF DE
  POSIT ";F1
5440 IFSC<>1THENPRINT"SORTING FOR SEARC
  H.":CMD"O",X+1,WT(0),DA(0),ZD(0),TY(0
  ),SZ(0):SC=1:PRINT"SORT COMPLETED."
5450 Y=0:IFTS=32767THENY=X:GOTO5490
5460 IFWT(Y)<>1THENPRINT"DEPOSIT OF ";A
  D;" FOR $";F1;"NOT FOUND.":GOTO5320
5470 IFZD=ZD(Y)ANDF1=CSNG(DA(Y))THENPM=
  Y:GOSUB6020:GOTO5320
5480 Y=Y+1:IFY<=XTHENGOTO5460ELSEPRINT"
  DEPOSIT OF ";AD;" FOR $";F1;"NOT FOUN
  D.":GOTO5320
5490 IFWT(Y)<>32767THENPRINT"SERVICE CH
  ARGE FOR ";AD;" NOT FOUND.":GOTO5320
5500 IFZD=ZD(Y)THENPM=Y:GOSUB6020:GOTO5
  320

5510 Y=Y-1:IFY>-1THENGOTO5490ELSEPRINT"
  SERVICE CHARGE FOR ";AD;" NOT FOUND."
  :GOTO5320
5520 CLS
5530 GOSUB6290:INPUT"ENTER EARLIEST DAT
  E TO SEEK (MM/DD/YY)";AD:P=USR0(VARPT
  R(AD)):IFAD="END"THENCLS:GOTO5200ELSE
  GOSUB10000:V1=ZD
5540 INPUT"ENTER LATEST DATE TO SEEK (M
  AY BE SAME AS EARLIEST)";AD:GOSUB1000
  0:V2=ZD:IFV2<V1PRINT"LAST DATE CANNOT
   BE EARLIER THAN EARLIEST DATE!!":PRI
  NT:GOTO5530
5550 IFSC<>2THENPRINT"SORTING FOR DATE
```

```
SEARCH.":CMD"O",X+1,ZD(Ø),WT(Ø),DA(Ø)
,TY(Ø),SZ(Ø):SC=2:PRINT"SORT COMPLETE
D."
5560 PRINT"SEARCHING.":GOSUB6410
5570 PM=(PH-PL)/2+PL:IF(ZD(PM)=>V1)AND(
ZD(PM)<=V2)THENGOTO5610
5580 IF((PL+PH)=PC)OR(PM<=PB)OR(PM>=PT)
THENCLS:PRINT"NO ITEMS FOUND WITHIN D
ATES SPECIFIED.":GOTO5530
5590 PC=PL+PH:IFZD(PM)>V1THENPH=PM:GOTO
5570
5600 PL=PM:GOTO5570
5610 IFPM=ØTHEN5640
5620 PM=PM-1:IFZD(PM)>=V1ANDZD(PM)<=V2T
HEN5610
5630 PM=PM+1:IFPM>PTTHENGOTO5670
5640 GOSUB6020
5650 PM=PM+1:IFPM>PTTHEN5670
5660 IFZD(PM)>=V1ANDZD(PM)<=V2THEN5640
5670 PRINT:PRINT"ALL ITEMS WITHIN DATES
SPECIFIED HAVE BEEN LISTED.":GOTO553Ø
5680 CLS
5690 PRINT@PA-64,"ENTER NEGATIVE VALUE
TO RETURN TO MENU":FORP=ØTO3:PRINTA(P
);:NEXTP:INPUTTY:IFTY<ØTHENCLS:GOTO52
ØØ
5700 IFTY<ØORTY>YBTHENCLS:PRINT"INVALID
TYPE CODE.":GOTO5690
5710 IFSC<>3THENPRINT"SORTING FOR SEARC
H.":CMD"O",X+1,TY(Ø),WT(Ø),DA(Ø),ZD(Ø
),SZ(Ø):SC=3:PRINT"SORT COMPLETE."
5720 PRINT"SEARCHING.":GOSUB6410
5730 PM=(PH-PL)/2+PL:IFTY(PM)=TYTHENGOT
O5770
5740 IF((PL+PH)=PC)OR(PM<=PB)OR(PM>=PT)
THENCLS:PRINT"NO ITEMS OF TYPE #";TY;
"FOUND.":GOTO5690
5750 PC=PH+PL:IFTY(PM)>TYTHENPH=PM:GOTO
5730
5760 PL=PM:GOTO5730
5770 IFPM=ØTHEN5800
5780 PM=PM-1:IFTY(PM)=TYTHENGOTO5770
5790 PM=PM+1:IFPM>PTTHENGOTO5830
5800 GOSUB6020
5810 PM=PM+1:IFPM>PTTHEN5830
5820 IFTY(PM)=TYTHEN5800
5830 PRINT"LAST MATCH IN FILE HAS BEEN
LISTED.":PRINT:GOTO5690
5840 CLS
5850 INPUT"ENTER THE LEAST AMOUNT TO SE
ARCH FOR, OR
ENTER A NEGATIVE AMOUNT TO RETURN TO ME
NU";F1:IFF1<ØTHENCLS:GOTO5200
5860 INPUT"ENTER THE GREATEST AMOUNT TO
SEARCH FOR.
THIS MAY BE EQUAL TO THE LEAST AMOUNT A
LREADY ENTERED.";F2
5870 IFF2<F1THENPRINT"GREATEST AMOUNT M
AY NOT BE LESS THAN LEAST AMOUNT.":PR
INT:GOTO5850
5880 IFSC<>4THENPRINT"SORTING FOR SEARC
H.":CMD"O",X+1,DA(Ø),WT(Ø),ZD(Ø),TY(Ø
),SZ(Ø):SC=4:PRINT"SORT COMPLETED."
5890 PRINT"SEARCHING.":GOSUB6410
5900 PM=(PH-PL)/2+PL:IFCSNG(DA(PM))>=F1
ANDCSNG(DA(PM))<=F2THENGOTO5940
5910 IF((PL+PH)=PC)OR(PM<=PB)OR(PM>=PT)
)THENCLS:PRINT"NO ITEMS FOR VALUES EN
TERED FOUND.":GOTO5850
5920 PC=PH+PL:IFCSNG(DA(PM))>F1THENPH=P
M:GOTO5900
5930 PL=PM:GOTO5900
5940 IFPM=ØTHEN5970
5950 PM=PM-1:IFCSNG(DA(PM))>=F1CSNG(DA(
PM))<=F2THEN5940
5960 PM=PM+1:IFPM>PTTHEN6000
5970 GOSUB6020
5980 PM=PM+1:IFPM>PTTHEN6000
5990 IFCSNG(DA(PM))>=F1ANDCSNG(DA(PM))<
=F2THEN5970
6000 PRINT"ALL ITEMS WITHIN VALUE LIMIT
S IN FILE HAVE BEEN LISTED.":PRINT:GO
TO5850
6010 END
6020 CLS:IFWT(PM)=1THENAL="DEP":GOTO605
Ø
6030 IFWT(PM)=32767THENAL=" SC":GOTO605
Ø
6040 AL=STR$(WT(PM)-1)
6050 PRINT"ITEM ";AL;"      DESCRIPTION:
";BT(TY(PM))
6060 PRINT"DATE: ";:ZD=ZD(PM):GOSUB1015
Ø:PRINTAD
6070 PRINTUSING"AMOUNT: $##,###.##";DA(
PM):PRINT
6080 PRINT"DO YOU WISH TO MAKE ANY CORR
ECTIONS TO THE ITEM (Y/N) ? ";:GOSUB6
280:IFA="N"THENRETURN
6090 PRINT"CORRECT THE DATE (Y/N/E)? ";
:GOSUB6280:IFA="N"THEN6110ELSEIFA="E"
THEN6210
6100 CH%=CH%+1:INPUT"ENTER NEW DATE (MM
/DD/YY)";AD:GOSUB10000:ZD(PM)=ZD
6110 PRINT"CORRECT THE AMOUNT (Y/N/E)?
";:GOSUB6280:IFA="N"THEN6130ELSEIFA="
E"THEN6210
6120 CH%=CH%+1:INPUT"ENTER THE CORRECT
AMOUNT";DA(PM)
6130 PRINT"CORRECT THE ITEM NUMBER (OR
CHANGE TYPE ITEM)(Y/N/E) ?";:GOSUB628
Ø:IFA="N"THEN6190ELSEIFA="E"THEN6210
6140 CH%=CH%+1:PRINT"ENTER THE CORRECT
ITEM NUMBER OR "A9"DEP"A9" OR "A9"SC"
A9" ";:INPUTAL
```

```
6150 IFAL="DEP"THENSZ(PM)=1:WT(PM)=1:GO
  TO6190
6160 IFAL="SC"THENSZ(PM)=-1:WT(PM)=3276
  7:GOTO6190
6170 WT=VAL(AL)+1:IFWT<2THENPRINT"CHECK
   NUMBER "AL" CANNOT EXIST.":GOTO6140
6180 SZ(PM)=-1:WT(PM)=WT
6190 CH%=CH%+1:PRINT"CORRECT THE ITEM D
  ESCRIPTION OF ITS TYPE (Y/N)";:GOSUB6
  280:IFA<>"Y"THEN6210
6200 GOSUB12000:TY(PM)=TY
6210 PRINT"
FIND FUNCTION TERMINATED
"
6220 LPRINT"CORRECTED DATA:"
6230 LPRINT"ITEM ";AL;"      DESCRIPTION
  : ";BT(TY(PM))
6240 LPRINT"DATE: ";:ZD=ZD(PM):GOSUB101
  50:LPRINTAD
6250 LPRINTUSING"AMOUNT: $##,###.##";DA
  (PM):LPRINT
6260 RETURN
6270 PRINT:PRINT"PRESS  Y, N, OR E TO C
  ONTINUE ";
6280 A=INKEY$:IFA=""THEN6280ELSEP=USR0(
  VARPTR(A)):IFA<>"Y"ANDA<>"N"ANDA<>"E"
  THEN6280ELSEPRINTA:RETURN
6290 PRINT:PRINT"ENTER "A9"END"A9" TO R
  ETURN TO MENU":RETURN
6300 IFERR/2+1=54THENPRINT"FILE ";AF;"
  NOT FOUND ON DISK.
RETRY WITH DIFFERENT FILE NAME.
FILES AVAILABLE ON DRIVE 1 ARE:":FORYQ=
  0TO600:NEXTYQ
6310 RESUME6320
6320 ONERRORGOTO0:CMD"DIR 1"
6330 GOTO5120
6340 CLS:PRINT"COMPUTING TOTAL FOR FILE
   ";AF
6350 DB=0:DT=0:FORY=0TOX:DT=DT+(DA(Y)*S
  Z(Y)):IFTY(Y)=0THEN6370
6360 DB=DB+(DA(Y)*SZ(Y))
6370 NEXTY
6380 PRINT"BALANCE FOR FILE ";AF"; IS "
  ;:PRINTUSING"$##,###.## WITH BAL FWD.
  ";DT:PRINTUSING"$##,###.## W/O BAL FW
  D.";DB
6390 PRINT:PRINT"PRESS <ENTER> TO CONTI
  NUE";
6400 A=INKEY$:IFA<>CHR$(13)THEN6400ELSE
  CLS:GOTO5200
6410 PL=0:PB=0:PT=X:PH=X+1:PC=0:RETURN ■
```

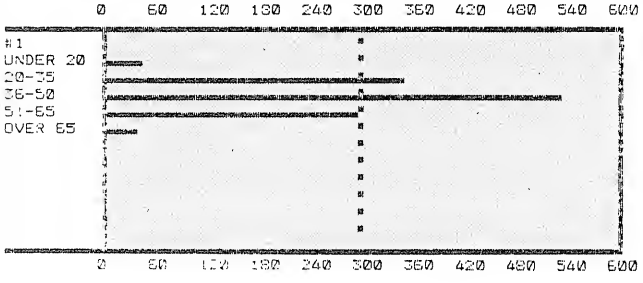
Reader survey

Results of the April questionnaire

Mike Schmidt, Publisher

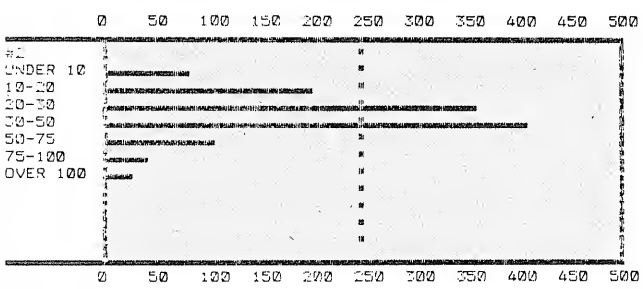
The results of our April 1982 reader survey have been tabulated. The findings of this survey are based on 1264 respondents. The numbers above the graphs which follow indicate the number of responses to a given class or category. In many cases, the total number of responses exceeds the total number of surveys returned because multiple answers were possible.

Age?



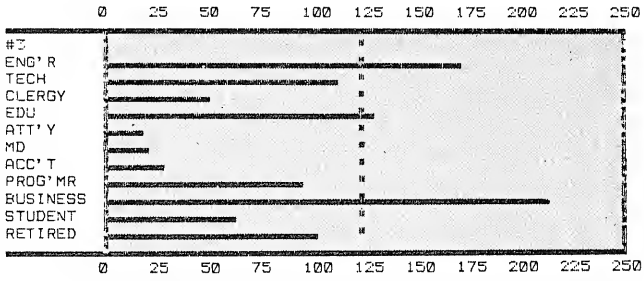
As you can see from Figure 1, the bulk of our readers are in the 36- to 50-year range. Comparison to our survey taken two years ago indicates that our average reader is slightly older. The number of people in the 20- to 30-year-old group has dropped by six percent since the last survey. Almost 60 percent of our readers have a personal income in the $20,000 to $50,000 range.

Personal income?



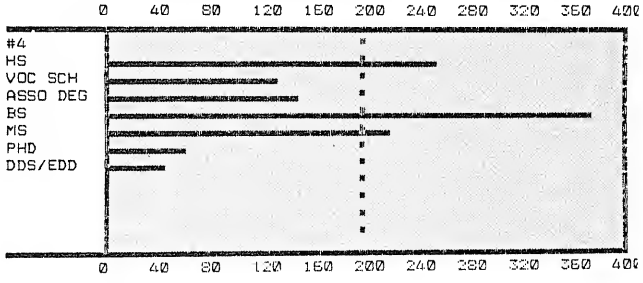
The distribution of professions has stayed largely the same over the past two years. Two years ago, there were so many who wrote in "clergy" or "retired" that we added them to the current survey. Clergy now account for about four percent, and retired about eight percent of the respondents. Business people are still the largest group of readers.

Occupation?



Over 50 percent of our readers still hold college or graduate degrees. The average educational level of our readers is approximately a B.S. degree. The Ph.D. is getting rarer, but we show gains on the M.S. degree.

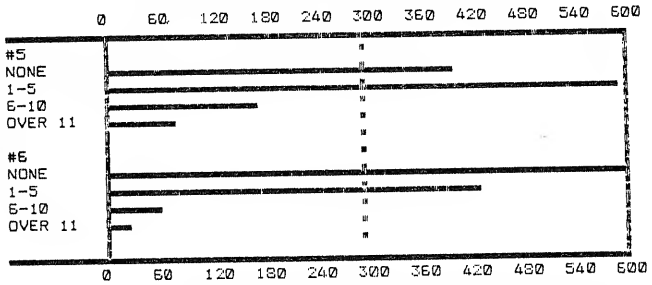
Education?



The number of games purchased has grown. This is expected, since the number available has increased, and the quality of games has improved. Over 20 percent of our readers bought over five games within the last year as compared to only 12 percent who did so in 1980.

How many computer games have you purchased in the past year?

How many educational programs have you purchased in the past year?

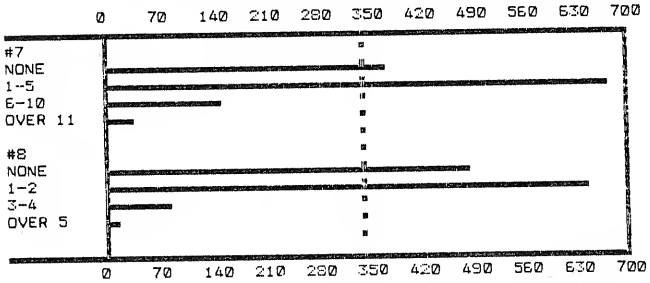


Educational software is still not getting the play expected of it. Over half of those answering this question have bought none in the past year.

Business software is the big seller. Over 68 percent have purchased business software in the past year.

How many business programs have you purchased in the past year?

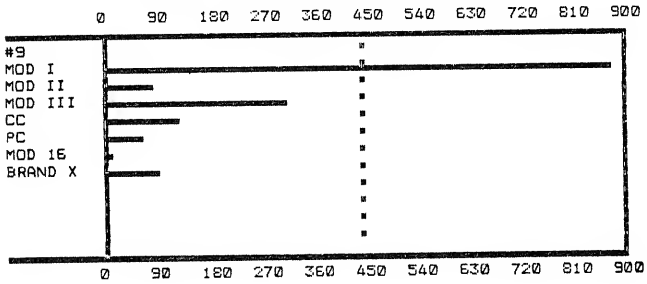
How many operating systems have you purchased in the past year?



Operating systems are popular. Over half of our readers have purchased one or two in the past year. This is interesting, since the TRS-80 comes *with* an operating system.

The distribution of TRS-80 models has changed drastically — many new models have been introduced since our last survey. The Model I is still owned by the largest group: 55.5 percent. There are even 11 proud owners of the Model 16. (Remember that this survey was taken in April and the Model 16 was not available. Actually, the wording of the question was "Model 16 on order.") The most surprising response to this question was that over one-third of the people owned more than one TRS-80 computer.

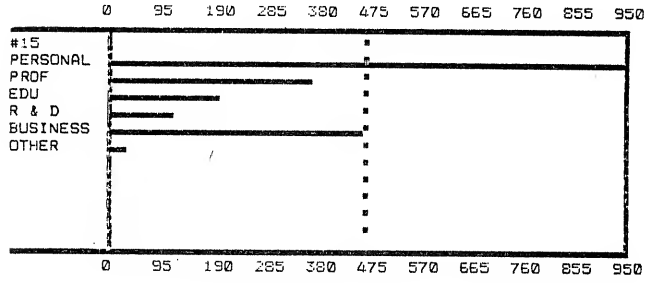
Which computers do you own?



Over 71 percent of our readers now have disk drives, compared to 50 percent in 1980. Most software is purchased via mail order (43 percent), followed closely by purchase through local stores (32 percent).

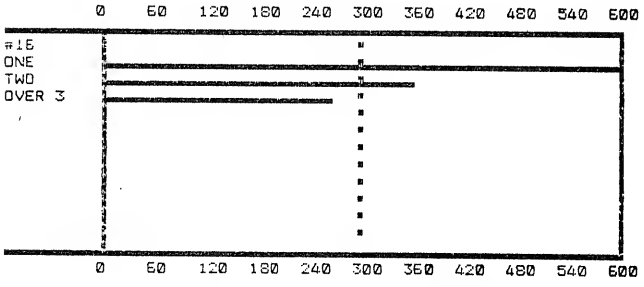
The computer itself is purchased from local stores (62 per cent) and from mail order businesses (34 percent). Local stores lead in the sale of line printers (48 percent), and mail order comes in at 34 percent.

How is your computer used?



This question prompted some very interesting answers. Personal/hobby use of the computer was double that of any other category. Business usage was second, with professional being third. Educational use was next, followed by research and development. These results clearly show that the microcomputer is, indeed, a "personal" computer.

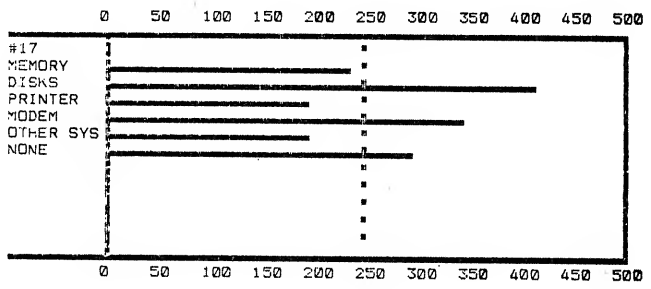
How many people in your household use personal computers?



About half of the households surveyed contained individual operators. Approximately 30 percent have two people using personal computers, and a surprising 21 percent are used by three or more people.

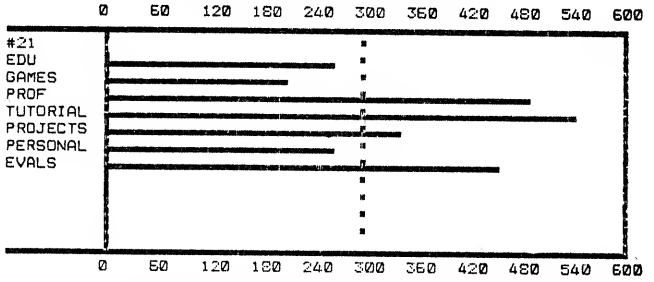
Plans for expansion in the next year included adding disk drives (24 percent), adding a modem (20 percent), adding memory (14 percent) and adding a printer (12 percent). Two years ago, adding disks was first, followed by adding memory and buying a printer. Modems were low on the list then. Now, a modem is the second most-wanted expansion.

What are your plans for expansion in the next year?



Most readers want to know of more ways to use their computers. Over 20 percent suggested more tutorial articles. Building projects are wanted by 12 percent. Sixteen percent would like to see more evaluations and reviews.

Which articles would you like to see more of in the future?



Eighty-six percent evaluated readability of the magazine as good/excellent as opposed to only 68 percent in 1980. We have been working hard on readability and content value. It's rewarding to know that the effort has not gone unnoticed.

Now that all of the clinical stuff is out of the way, just what does all of this prove? You bought a good computer (probably at a fair price), and are having a good time learning how to use it. It probably keeps you out of the bars and pool halls. You spend money on new additions to your system whenever the price meets what you see as a fair value.

What will this do for *80-U.S. Journal*? It gives that added "tweek" to our editorial direction. We live with the industry daily and try to keep on top of new directions. Your input serves not only as a measuring stick of what is needed, but tells us how well we are actually reading our audience.

The last question on the survey, having to do with providing the programs in *80-U.S. Journal* on tape or diskette, has caused quite a stir around here. Sixty-two percent of you said you would go for it. There are several ways we could do this and the methods available are under serious consideration. The problems, now that there are several models to consider, are with compatibility. For example, tape will not work with Model II. There are different diskette formats for Model I, III and the Color computer. Also with diskettes, there are different densities and tracks to consider. It may turn out that the only common link between all the models will be RS-232 and telecommunication. We are looking at the available alternatives.

Your input has been useful. We will make adjustments to our editorial direction because of it and we thank you for your participation. ■

Open ended geography

A spelling/geography word game

Model I/III

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Remember the endless time you could spend playing the old game of naming a word, with a friend naming one starting with the last letter of yours?

Well, such an excercise can encourage a student to "visualize" words and mentally spell them. That's the first step toward mastering the art of good spelling. If we couple some recognition of the names of the states, we come up with a handy, "fun" way of teaching two concepts.

In "Open-Ended Geography," we allow more flexibility in the responses. You may put a word in front of the last, or behind it. This means you need to match the last letter of the new word to the first of the former, or vice versa. It offers a challenge, and it will surprise you how many combinations continue to come up as the 50 states are used. No state can be played twice.

To avoid frustration, the computer will take your turn if you call for "help." Score is given to the player for a successful entry, or to the computer on "his" turn. Scoring can easily be deleted if you don't want competition involved.

The program was written on a TRS-80 Level II machine. It uses fairly "standard" BASIC statements, however. Without the remarks, it occupies very little memory. The general "flow" can be adapted to many "turns" type games, and will offer you a chance to exchange a second player's response for the computer's turn, if you want a two-player game.

After you play the game, I think you'll pick up some forgotten knowledge of the letter arrangement of the states. Plus, if you follow the coding, you'll see other programming possibilities.

A double payoff for "teacher" and "learner" has to be worth the keyboard time!

Program Listing for Geography

```
1 '************************************
2 ' OPEN ENDED G E O G R A P H Y
3 '  R.K. FINK   10/20/80  MOD I/III
4 '************************************
20 '
90 '  INITIALIZE AND DECIDE WHO'S FIRST

100 CLEAR2000:DIMS$(50)
110 CLS:PRINT"    WHO'S FIRST... FOR SO
  ME":GOSUB5000:CLS:PRINT@256,CHR$(23);
  "G E O G R A P H Y...":PRINT
120 INPUT"... 'YOU'  OR  'ME' ..";AN$
130 IF AN$="YOU"THEN TR=1:GOTO160
140 IF AN$="ME" THEN TR=0:GOTO160
150 CLS:GOTO110
155 '    ::: INITIALIZE THE STATES ARRA
  Y  :::
156 '      :: EACH NEW GAME WILL START H
  ERE ::
160 T=TR:FORI=1TO50:READS$(I):NEXTI
170 F=0:CLS
180 IF T=1 THEN200 ELSE GOTO 500
190 '
195 '  ::: COMPUTER MOVES FIRST ('MAINE
  ' IS NOT ALLOWED) :::
200 R=RND(50):IFR=1THEN200
```

```
210 A$=S$(R):N=R:NR$=RIGHT$(A$,1):NL$=L
  EFT$(A$,1):GOSUB1000
220 F=0:GOSUB2000
230 C=C+1:GOSUB900:T=0:GOTO250
240 '
245 '    ::: ALL SUBSEQUENT MOVES START
   HERE  :::
250 IF T=0 THEN300 ELSE 400
290 '
295 '    ::: HUMAN'S SUBSEQUENT MOVE  ::
  :
300 GOSUB3000:IF IP$="HELP" THEN 600
310 FF=0:GOSUB3500
320 IF FF=3THENPRINT@832,CHR$(31);"OOPS
  ...THAT ONE'S BEEN USED BEFORE!!";:GO
  SUB5000:GOTO300
330 F=0:GOSUB4000
340 IF F=3THEN PRINT@832,CHR$(31);"THAT
   ONE WON'T FIT EITHER END!!..TRY AGAI
  N";:GOSUB5000:GOTO300
350 GOSUB1000:GOSUB2000
360 H=H+1:GOSUB900:T=1:GOTO250
380 '
390 '    :::  COMPUTER'S SUBSEQUENT MOVE
  S  :::
400 GOSUB5000:R=RND(50):FORN=1TO50
410 A$=S$(R):IF A$<>"" THEN450
415 R=R+1:IF R>50THEN R=1
420 NEXTN:GOTO700
450 GOSUB4000:IF F=3 THEN415
460 N=R:GOSUB1000:GOSUB2000
470 C=C+1:GOSUB900:T=0:GOTO250
480 '
490 '   ::: HUMAN MOVES FIRST :::
500 GOSUB3000:IF IP$="MAINE" THENPRINT@
  832,CHR$(31);"OH COME ON... THAT'S TO
  O EASY A WIN.  TRY ANOTHER.";:GOSUB50
  00:GOTO500
510 GOSUB3500:NR$=RIGHT$(A$,1):NL$=LEFT
  $(A$,1):GOSUB1000:F=0:GOSUB2000
520 H=H+1:GOSUB900:T=1:GOTO250
580 '
590 '    ::: HUMAN NEEDS HELP!!  :::
600 PRINT@832,CHR$(31);"OK... I'LL TAKE
   YOUR TURN TO HELP YOU!!";:GOSUB5000
610 T=1:GOTO250
680 '
690 '    ::: NO MORE MOVES... END THE GA
  ME  :::
700 CLS:PRINTCHR$(23):GOSUB900:PRINT:PR
  INT"WELL...
     NO PLAYS ARE LEFT >>>"
710 PRINT:PRINT:INPUT"THANKS.. GOOD GAM
  E
        PLAY AGAIN???..(Y/N)";AA$
730 IF AA$="N" THEN END
740 IF TR=1 THEN TR=0 ELSE TR=1
750 H=0:C=0:RESTORE:GOTO160
760 '
770 '
800 DATAMAINE,HAWAII,GEORGIA,FLORIDA,MO
  NTANA,MISSOURI,SOUTH CAROLINA,RHODE I
  SLAND,WYOMING,WISCONSIN,MISSISSIPPI,M
  INNESOTA,PENNSYLVANIA,OREGON,WEST VIR
  GINIA, WASHINGTON
810 DATAVIRGINIA,VERMONT,UTAH,OKLAHOMA,
  OHIO,NORTH DAKOTA,MICHIGAN,MASSACHUSE
  TTS,MARYLAND,DELAWARE,CONNECTICUT,COL
  ORADO,CALIFORNIA,LOUISIANA,KENTUCKY,K
  ANSAS
```

```
820 DATANORTH CAROLINA,NEW YORK,TEXAS,T
  ENNESSEE,SOUTH DAKOTA,NEW MEXICO,IOWA
  ,INDIANA,ARKANSAS,ARIZONA,ALASKA,ILLI
  NOIS,IDAHO,ALABAMA,NEW JERSEY,NEBRASK
  A,NEW HAMPSHIRE,NEVADA
830 '
840 '   ::: DISPLAY THE SCORE  :::
900 PRINT@0,"ME... ";C,"YOU..... ";H;:R
  ETURN
990 '
995 '   ::: THESE ARE THE UTILITY SUBROU
  TINES  :::
999 '        ** NULL ARRAY AFTER ACCEPTA
  BLE ENTRY **
1000 S$(N)="":L=LE:LE=LEN(A$):R$=NR$:L$
  =NL$:RETURN
1990 '
1995 '  ** DISPLAY AN INPUT  F IS RT, L
  EFT OR MIDDLE FLAG  **
2000 IF F=0 THEN S=478:GOSUB2030:GOTO20
  40
2010 IF F=1 THEN S=477-LE:GOSUB2030:GOT
  O2050
2020 IF F=2 THEN S=SR:GOSUB2030:GOTO205
  0
2030 FORN=1 TO LE:POKE15360+S+N-1,ASC(M
  ID$(A$,N,1)):NEXTN:RETURN
2040 SR=479+LE:RETURN
2042 '
2045 '   ** MOVE LAST WORD IN TO CENTER
   **
2050 GOSUB5000:B$=STRING$(LE+L+2,32):IF
   F=2 THEN 2130
2060 FOR N=1 TO LE+1
2070 PRINT@S,B$;
2080 PRINT@S+N,A$;
2090 FORT=1TO15:NEXT
2100 NEXTN
2110 S=478:SR=479+LE
2120 RETURN
2130 FOR N=S TO 478 STEP-1
2140 PRINT@478,B$;
2150 PRINT@N,A$;
2160 FORT=1TO15:NEXT
2170 NEXTN
2180 GOTO2110
2980 '
2990 '   ** INPUT A HUMAN MOVE **
3000 PRINT@832,CHR$(31);"O K ... YOUR T
  URN,  WHAT STATE???"
3010 INPUT"(IF YOU'RE STUMPED TYPE...'H
  ELP')";IP$
3020 PRINT@832,CHR$(31);
3030 RETURN
3480 '
3490 '   ** GET STATE ARRAY NUMBER **
3500 FOR N= 1TO 50
3510 IFS$(N)=IP$ THENA$=S$(N):RETURN
3520 NEXTN
3530 FF=3:RETURN
3980 '
3990 '   ** SEE WHICH END FITS **
4000 NL$=LEFT$(A$,1):NR$=RIGHT$(A$,1)
4010 IFNL$=R$ THEN F=2:GOTO4040
4020 IFNR$=L$ THEN F=1:GOTO4040
4030 F=3:RETURN
4040 RETURN
4990 '   ** DELAY TIMER  **
5000 FORTT=1TO1000:NEXT:RETURN ■
```

Files and foibles

Recursive programming

Model I/II/III and Color Computer

On our travels through techniques for dealing with files, we've covered quite a few foibles. This time we'll cover still another that's needed to get back to binary trees: 'recursive' programming.

Technically speaking, I really haven't found a definition of 'recursion' adequate for the job. I think the Devil's D.P. Dictionary (Stan Kelly-Bootle, McGraw-Hill, New York, $7.50) defined it best:

recursive, adj., See RECURSIVE

Simply put, something which is recursive uses itself in its own definition.

In programming, it is occasionally useful in solving a problem to be able to have a subroutine call itself. In every case I know of, there is always a way of solving the problem in a non-recursive manner. However, in some cases, expressing the problem solution in non-recursive terms makes it more difficult to follow. This clouds the solution, and can make the program harder to write and debug.

Recursive techniques were first studied in a systematic fashion in the 1920s by mathematicians. Many functions are most simply defined in terms of 'recurrence' relations.

For example, the 'Fibonacci' numbers are defined by the sequence:

```
f(0)=1
f(1)=1
 :
 :
f(n+1)=f(n)+f(n-1)
```

Fibonacci numbers are named after Leonardo Pisano, sometimes called Leonardo Fibonacci, who originated them in 1202, to solve the problem of how many pairs of rabbits can be produced from a single pair in a year's time. These numbers occur frequently in biological problems and computer science.

We'll find that the technique for printing a binary tree in alphabetical order will involve some recursive programming (or its equivalent). Let's deal with recursion first, without having to worry about file handling.

Programming Recursion

Some computer programming languages (such as Pascal) can handle recursion directly. If you want a subroutine (procedure in Pascal) to call itself, you simply call it. This makes the use of recursive techniques natural in this kind of language. BASIC isn't that capable.

There is no problem with BASIC calling itself. You can GOSUB to anywhere, from anywhere, without restriction. (Try Program 1 to see what I mean.) The problem is that you really can't get much from it.

In BASIC, all variables are shared by every subroutine. This makes them "global." In most cases, however, we want to deal with different numbers at each call to a subroutine. We have to save the status of the subroutine before we have it call itself again. When it returns, we have to get back what we were using when we called it. Confusing, isn't it?

That's the problem with recursion for most people. Just talking about it makes your head swim. In some cases, it's kind of like pulling yourself up by your bootstraps. If we do sort out the problem, and make sense of it, it becomes a powerful technique that expands what you can do with your programming.

I'd like to explain recursion by example — a rather

famous one, which has a very nice recursive solution: The Towers of Hanoi.

The Towers of Hanoi Problem

The Towers of Hanoi problem first occurred (to my knowledge) around the end of the 19th century in European novelty shops. It was said to be a very serious game which was being played in an Eastern temple (the Temple of Bramah). The priests played it in the belief that when they were done, it would signify the end of the world.

It was said that the priests were playing the game with 64 golden disks on three towers. (The novelty version only had eight disks on three towers.) The game starts with all of the disks on the first tower stacked so that they proceed from the largest, on the bottom, to the smallest, on the top.

The objective of the game is to move all of the disks to another tower, one disk at a time, without *ever* putting a larger disk over a smaller one. It seems easy, but it has been proven that if there are N disks, it will take 2^n-1 moves to complete the task.

For the priest of Bramah, this means that they will need 18.4467×10^{18} moves. If they make one move per second, it will take them approximately 585 billion years to complete the task!

Solving the problem by computer is a fairly difficult task until you look at the problem as a recursive one. If we start out with five disks, the normal approach is to deal with the problem one disk at a time — move it, then the next, and the next, and so forth. We could check the rules, decide on a disk, move it, check the rules again, etc.

The problem with this approach is that it leads to some blind alleys. We can easily get into positions where we have to undo what we've done and try a new approach. Let's break down the problem another way.

Instead of worrying about the top disk, let's look at the bottom disk first. In order to move the bottom disk (number 5) from tower 1 to tower 2, we'll need to have moved the rest of the disks from tower 1 to tower 3 first. After we've moved the rest of the disks, then we move disk 5 to tower 2, then move the rest of the disks from tower 3 to tower 2. After that, we're done! Easy wasn't it.

How do we move the rest of the disks? We haven't figured out how to do that, have we . . . or have we? If the technique works for disk 5, it will work equally well for each other disk.

To move disk 4 from tower 1 to tower 3, we'll first have to move disks 1-3 to tower 2, them move disk 4 to tower 3. Next, we move disks 1-3 to tower 3.

At each stage of the game, we are trying to move a bottom disk to another tower by first moving the disks above it to the third tower. We could write this out like this: move N disks from tower A to B, using C for temporary storage.

1. If the number of disks to move is greater than 1, then move n-1 disks to tower C.
2. Move nth disk to tower B.
3. If the number of disks is greater than 1, then move n-1 disks from tower C to tower B.

Each time we say move some number of disks, we start over at step 1 with the new number of disks to move. Look at Figure 1 to see how to move three disks from tower 1 to tower 2.

To program this, we have to remember where 'from,' 'to,' and 'temporary' are, as well as the number of disks to move each time we make a recursive call to the subroutine. The simplest way to do this is with a stack.

The program that solves the Towers of Hanoi problem remembers what the current parameters are every time the subroutine itself is called (except for the very first) by pushing all four numbers into a stack array which is two-dimensional. Just before returning from the routine, we get back the last set of parameters, since we'll be returning into the middle of the routine (except for the very last time).

Let's look through the program. Lines 100 through 150 initialize the program, while lines 200 through 260 form a simple command loop.

The important parameters are FRM (the tower we're moving disks from), TT (the tower we're moving disks to), TMP (the tower we're going to use for temporary storage), and N (the number of disks to move). After setting these parameters to move all of the disks from tower 1 to tower 2, we initialize the towers in subroutine 900 by setting the value of the first N places of the array for tower 1, and zeroing the others.

The subroutines at 1200, 1300 and 1400 display the towers, stack, and number of moves, respectively. After the display is complete, we start the recursive process by the GOSUB1000.

The subroutine from line 1000-1050 is a simple translation of our design above. If there's more than one disk, we GOSUB2000, which pushes N, FRM, TT and TMP onto the stack. Then we set up to move the N-1 disks above the bottom to TMP by setting TT to TMP and TMP to TT and then GOSUB1000. This is the first recursive call.

When we finally get down to N=1, we pass to line 1020, where we move a single disk (GOSUB1100) and then display the result (GOSUB1200). This also happens if we return after the subroutine call above.

When N>1, we save N, FRM, TT and TMP again, and set up to move the disks back from TMP to TT. This makes the second recursive call in the subroutine.

Whenever we're ready to leave the subroutine, we have to do a GOSUB2100 to get the last set of parameters off of the stack to be ready for the completion of the previous step.

After you get the program typed in (remember that only line numbers which are multiples of 10 are needed), try running it for 1-10 disks. The display will be slow enough to follow the steps as they proceed. If you watch it long enough, you'll begin to anticipate the moves.

Watch the display of the stack also, as the problem proceeds, and see just what is kept there.

Enjoy playing with this one. Your mind may feel like a pretzel before you figure it out, but once you do, you will have a new technique and have had some interesting (although frustrating) times. You might try replacing the subroutine which displays the towers with one that draws the towers and disks with graphics instead of numbers.

No matter how you do it, have fun.

Sequence of Moves for Three Disks

We'll symbolize a call to the move disks subroutine (GOSUB1000) like this:

MOVE(N,FRM,TT,TMP)

where N, FRM, TT and TMP are the program variables. The table below summarizes the operations and shows the line number trace for all lines in the 1000 subroutine.

Figure 1

Operation	Line Numbers
1. MOVE(3,1,2,3)	1000
2. MOVE(2,1,3,2)	1010 1000
3. MOVE(1,1,2,3)	1010 1000 1010
4. move disk 1 to twr 2	1020 1030 1040 1050

5. move disk 2 to twr 3	1020
6. MOVE(1,2,3,1)	1030 1000 1010
7. move disk 1 to twr 3	1020 1030 1040 1050
	1040 1050
8. move disk 3 to twr 2	1020
9. MOVE(2,3,2,1)	1030 1000
10. MOVE(1,3,1,2)	1010 1000 1010
11. move disk 1 to twr 1	1020 1030 1040 1050
12. move disk 2 to twr 2	1020
13. MOVE(1,1,2,3)	1030 1000 1010
14. move disk 1 to twr 2	1020 1030 1040 1050
	1040 1050 1040 1050

Program Listing for Recursion

```
10 REM ******************************
20 REM
30 REM  RECURSION DEMO 1
40 REM  TERRY R. DETTMANN
50 REM
60 REM ******************************
70 CLEAR1000
80 M=0
90 GOSUB1000
100 END
1000 REM - - - - - - - - - - RECURSIVE SU
BROUTINE - - - - - - - - - - - - - -
1010 PRINT"ENTERING SUBROUTINE ... M =
";M
1020 IF M<5 THEN M=M+1:GOSUB1000:M=M-1
1030 PRINT"LEAVING  SUBROUTINE ... M =
";M
1040 RETURN
```

Program Listing for Towers of Hanoi

```
10 REM ******************************
20 REM
30 REM TOWERS OF HANOI
40 REM DEMO OF RECURSION IN BASIC
50 REM TERRY R. DETTMANN
60 REM
70 REM VERSION 1.0 05/01/82
80 REM
90 REM ******************************
95 REM          CLEAR SOME STRING SPACE
100 CLEAR1000
105 REM         SET A 25 ELEMENT STACK
FOR 4 ITEMS STK
106 REM         TWR IS THE STATUS OF TH
E DISKS ON THE TOWER
107 REM         TP IS THE TOP OF EACH O
F THE THREE TOWERS
```

```
108 REM          LB$ IS AN ARRAY OF LABE
LS FOR THE STACK PRINTOUT
110 MX=25:DIM STK(25,4),TWR(10,3),TP(3)
,LB$(4)
115 REM          SP IS THE INITIAL STACK
 POINTER (0) AND BL$ IS A
116 REM          BLANK STRING USED TO CL
EAR THE REMAINDER OF A LINE
120 SP=0:BL$=STRING$(20," ")
125 REM          INITIALIZE THE STACK LA
BELS
130 FORI=1TO4:READLB$(I):NEXTI
140 DATA N,FROM,TO,TEMP
145 REM          LL IS THE SCREEN LINE L
ENGTH SET DEPENDING ON THE COMPUTER
150 LL=80:REM  LL=64  MOD I/III, LL=80
MOD II, LL=32 COLOR COMPUTER
200 REM - - - - - - - - - - COMMANDS - -
- - - - - - - - - - - - - - - - - - - -
205 REM          INITIALIZE THE PROBLEM
(HOW MANY DISKS)
210 CLS:PRINT"TOWERS OF HANOI":INPUT"HO
W MANY DISKS (1-10)";N:IF N>10 OR N<1 T
HEN 210
215 REM          NUM IS THE NUMBER OF MO
VES MADE
216 REM          EX IS THE THEORETICAL N
UMBER OF MOVES NEEDED
217 REM          FRM, TT, & TMP ARE THE
TOWER TO MOVE FROM, THE TOWER TO
218 REM          MOVE TO, AND THE TOWER
TO USE FOR A TEMPORARY DURING THE MOVE
219 REM          PRINTCHR$(2) TURNS OFF
THE CURSOR ON THE MODEL II
220 NUM=0:EX=2^N-1:FRM=1:TT=2:TMP=3:PRI
NTCHR$(2)
225 REM          INITIALIZE THE TOWERS,
PRINT THE TOWERS, STACK, AND
226 REM          NUMBER OF MOVES ON THE
SCREEN
230 GOSUB900:GOSUB1200:GOSUB1300:GOSUB1
400
235 REM          MOVE N DISKS FROM TOWER
 (FRM) TO TOWER (TT) USING
236 REM          TOWER (TMP) AS A TEMPOR
ARY
240 GOSUB1000
245 REM          SETUP FOR ANOTHER PROBL
EM
250 LX=15*LL:PRINT@LX,;:INPUT"AGAIN (Y/
N)";YN$:IF YN$="Y" THEN 200 ELSE IF YN$
<>"N" THEN 250
260 END
900 REM - - - - - - - - - INITIALIZE N
TOWERS - - - - - - - - - - - - - - -
905 REM          PUT ALL THE DISKS ON TO
WER 1 & NONE ON TOWER 2 & 3
906 REM          DISKS ARE PUT ON LARGES
T (HIGHEST NUMBER) AT BOTTOM
907 REM          (ARRAY LOCATION 1)
910 FORI=1TON:TWR(I,1)=N-I+1:TWR(I,2)=0
:TWR(I,3)=0:NEXTI
915 REM          SET THE TOPS OF EACH ST
ACK
920 TP(1)=N:TP(2)=0:TP(3)=0
930 RETURN
1000 REM - - - - - - - - - MOVE N TOWER
S - - - - - - - - - - - - - - - - - -
1005 REM         THIS SUBROUTINE MOVES N
 DISKS RECURSIVELY
1006 REM         IF THERE IS MORE THAN 1
 DISK TO MOVE, STACK THE CURRENT
1007 REM         PARAMETERS (N,FRM,TT,TM
P), RESET N TO N-1 AND FIRST MOVE
1008 REM         N-1 DISKS FROM TOWER FR
M TO TOWER TMP
1010 IF N>1 THEN GOSUB2000:N=N-1:FRM=FR
M:T=TT:TT=TMP:TMP=T:GOSUB1000
1015 REM         AFTER N-1 DISKS ARE MOV
ED, MOVE THE ONE DISK FROM TOWER
1016 REM         FRM TO TOWER TT THEN PR
INT THE TOWERS
1020 GOSUB1100:GOSUB1200
```

```
1025 REM          NOW MOVE THE N-1 DISKS
BACK TO TOWER TT RECURSIVELY
1030 IF N>1 THEN GOSUB2000:N=N-1:T=FRM:
FRM=TMP:TT=TT:TMP=T:GOSUB1000
1035 REM          AFTER ALL MOVES ARE DON
E AT THIS LEVEL, UNSTACK THE
1036 REM          LAST SET OF PARAMETERS
AND RETURN TO THE PREVIOUS LEVEL
1040 GOSUB2100
1050 RETURN
1100 REM - - - - - - - - - - MOVE ONE DIS
K - - - - - - - - - - - - - - - - - - -
1105 REM          TO MOVE ONE DISK FROM T
HE TOP OF TOWER FRM TO THE TOP
1106 REM          OF TOWER TT, GET THE NU
MBER ON TOP OF FRM (TWR(TP(FRM),FRM))
1107 REM          DECREASE THE TOP OF TOW
ER FRM
1110 T=TWR(TP(FRM),FRM):TP(FRM)=TP(FRM)
-1
1115 REM          INCREASE THE TOP OF TOW
ER TT BY ONE AND PUT THE DISK THERE
1120 TP(TT)=TP(TT)+1:TWR(TP(TT),TT)=T
1125 REM          INCREMENT THE COUNT OF
MOVES AND PRINT THE NUMBER OF MOVES
1130 NUM=NUM+1:GOSUB1400:RETURN
1200 REM - - - - - - - - PRINT TOWERS -
 - - - - - - - - - - - - - - - - - - -
1205 REM          LOOP OVER ALL THE TOWER
S
1210 FOR J=1 TO 3
1215 REM          PRINT THE TOWER LOCATIO
N
1220     LX=2*LL+J*LL:PRINT@LX,USING"TOW
ER ##>>";J;
1225 REM          IF THERE'S NOTHING ON T
HE TOWER, THEN JUST BLANK THE LINE
1230     IF TP(J)=0 THEN 1260
1235 REM          PRINT THE NUMBERS OF AL
L DISKS ON THE TOWER
1240     FOR I=1 TO TP(J)
1250          PRINTUSING"###";TWR(I,J
);:NEXTI
1255 REM          BLANK THE REST OF THE L
INE
1260     PRINTBL$:NEXTJ
1270 PRINT:PRINT:RETURN
1300 REM - - - - - - - - PRINT STACK VA
LUES - - - - - - - - - - - - - - - - -
1305 REM          PUT THE STACK POINTER O
N THE SCREEN
1310 LX=7*LL:PRINT@LX,USING"SP>>##";SP
1315 REM          LOOP OVER ALL FOUR ELEM
ENTS OF THE STACK
1320 FORJ=1TO4
1325 REM          PRINT THE ELEMENT IDENT
IFICATION
```

```
1330    LX=7*LL+J*LL:PRINT@LX,USING"\
\>>";LB$(J);
1335 REM        IF THERE'S NOTHING ON T
HE STACK, THEN NOTHING ELSE TO PRINT
1340    IF SP<=0 THEN 1380
1345 REM        PRINT THE ITEMS ON THE
STACK
1350    FORI=1TOSP
1360       PRINTUSING"###";STK(I,J);
1370       NEXTI
1375 REM        BLANK THE REST OF THE L
INE

1380    PRINT BL$;:NEXTJ
1390 RETURN
1400 REM - - - - - - - - - PRINT NUMBER O
F MOVES - - - - - - - - - - - - - - -
1405 REM        PRINT THE NUMBER OF MOV
ES AT PRESENT AND THE THEORETICAL

1406 REM        NUMBER EXPECTED
1410 LX=7*LL+LL/2:PRINT@LX,USING"MOVES>
> ####  EXP>> ####";NUM;EX;
1420 RETURN
2000 REM - - - - - - - - - PUSH PARAMETER
S ON THE STACK - - - - - - - - - - -
2005 REM        IF WE EVER OVERFLOW THE
 STACK, WE CAN'T GO FURTHER
2006 REM        SIMPLY END THE PROGRAM,
 TRY AGAIN WITH FEWER DISKS
2007 REM        IF YOU STAY WITHIN THE
PROGRAMS LIMITS, THIS SHOULDN'T
2008 REM        HAPPEN TO YOU
2010 IF SP>=MX THEN PRINT"ERROR - STACK
 FULL":END
2015 REM        STACK ALL FOUR PARAMETE
RS
2020 SP=SP+1:STK(SP,1)=N:STK(SP,2)=FRM:
STK(SP,3)=TT:STK(SP,4)=TMP
2025 REM        PRINT THE STACK
2030 GOSUB1300:RETURN
2100 REM - - - - - - - - - POP PARAMETERS
 OFF THE STACK - - - - - - - - - - -
2105 REM        IF THE STACK POINTER RE
ACHES 0, NOTHING IS LEFT TO
2106 REM        UNSTACK
2110 IF SP<=0 THEN RETURN
2115 REM        UNSTACK ALL 4 PARAMETER
S
2120 N=STK(SP,1):FRM=STK(SP,2):TT=STK(S
P,3):TMP=STK(SP,4)
2125 REM        PRINT THE STACK
2130 SP=SP-1:GOSUB1300:RETURN ■
```

@ News

Spencer Hall, Contributing editor

If you don't own a Stringy Floppy . . . don't go away just yet. ESF and Level II go together like ham and eggs, salt and pepper, etc. It's hard to say something about ESF without including a few tidbits of general interest to all Level II owners. Our lead story is a case in point.

An Open Letter to Dr. J. C.

Yes, the mailbag finally arrived from Sunnyvale. Along with some other items we'll mention later, there was your letter. Wow! I've heard of a group in England which is loyal to Level I and which meets regularly to share the exotic things that can be done with it (in machine language, mostly). Your own loyalty to Level I and your dogged determination to decipher its ROM and adapt your ESF to it have my profound respect. If you have succeeded by the time this appears in print, let's hear about it.

There is one line in your letter, however, that needs a polite response. I hope you won't mind my quoting it verbatim because it does, indeed, express the way many people feel about good old Level II. You say, in part "I have no intention of giving up the robustness of Level I for the flaky keyboard and cassette I/O of Level II."

Level II is an incredibly powerful language. We'll be another fifty years discovering all of the computer magic which it can do. I sincerely encourage you to apply your considerable talents to exploring its possibilities instead of knocking your brains out trying to harness a race horse to a donkey cart.

Here's a surprise for you and thousands of others. The best cure for the famous keybbbounce on older Model I Level IIs (before the new style keyboard was introduced) is not a machine language patch cluttering up RAM. It isn't an electronic fix either. Go to a supply house which carries industrial lubricants and get a tube of Dow Corning Molykote 4X Lubricant. Carefully lift each key off by prying gently from the lower right corner. Squirt a bit of lubricant into the make-break mechanism. Replace the key by pressing firmly. Look ma! No more keybounce. It's tedious work, I'll admit, and you'll have to pry the space bar from the middle to get at its switch. But once done, it lasts for years. Just don't try to pry up those new style keys on later Model Is that don't bounce

anyway. It's not necessary — and very fatal! As for the "flakey cassette I/O," who needs it if they have an ESF?

Slowing Your Computer Down

If you're into BASIC programming in Level II, this also is of interest even if you don't have an ESF system. It works especially well with ESF, but it operates also

with cassette or disk. For Model III, substitute these lines:

```
70 POKE 16561, 118:POKE 16562,X
80 A=120+256*X: IF A>32767 THEN A=A-65536
90 V=124+256*X: IF V>32767 THEN V=V-65536
120 PRINT "MEMORY SIZE IS SET AT" 118+256*X
140 PRINT "TO DEACTIVATE: POKE 16389,29
```

Ever want to LIST slowly in order to search for a place to modify or find some vacant lines to use without the need for world-class eye and finger coordination? Ever want to RUN with TRON and see the numbers come up slowly so that you can find out just how your program is getting from here to there? Listing 1 (let's call it SLOWPOKE) is a BASIC program which installs and protects a slower-downer at the top of memory. You can erase it when it has done its job. Run it and make notes of the instructions which appear on the screen. That will be your only chance. Then you can wipe out the code. The slowdown will not occur until you poke the proper number into address 16389 (for 16K,127; for 32K,191; for 48K,255).

Slowdown is widely variable. The display will tell you where to poke a speed control number (from 0 to 255). You can normalize your computer action by POKE 16389,48. When you want slow action again, just poke the proper number back into 16389. SLOWPOKE works on the execution of LIST, RUN (with or without TRON), the EDIT call, any direct mode instruction, etc. When it's active, your cassette recorder won't work, but your ESF will if you call it again! Unfortunately, using ESF deactivates the slowdown so that you will have to repoke 16389.

It's written to be near the top of 16K, 32K and 48K systems. The screen display will tell you where memory size is set. Radio Shack's classic Blackjack is a fun game to play in slowdown mode, especially if you're slow at counting card values the way I am. High speed control numbers, producing low speeds, are great for LISTing. Numbers under 50 are better for watching programs operate with TRON. You can see what language takes the most time to execute and which the least. If your BASIC program DIM's a large matrix or uses a long FOR . . . NEXT loop, plan to bring your lunch!

The Lore of the ESF

Exatron has been the most successful of any hardware manufacturer to date in encouraging production of public domain software for its product. They also have wafer versions of various copyrighted programs, enhanced patches for the classics like Pencil, Scripsit, EDTASM, the MISOSYS Disassembler, etc. ESFOA, the national ESF owners association, makes it possible to obtain copies of many programs which have appeared in national computer magazines as well as excellent software written and donated by members. These cost just the price of the medium they're on (wafer) plus handling. To date, I've seen nothing done on disk that can't be done on ESF using some of Exatron's proprietary software for which you generally pay less than the disk equivalent. Under the above section title, I'll be reviewing some of these products in

future issues. Next month it will be (if it arrives in time) FMS Volume 2. This is an improvement on Exatron's already popular File Management System.

Setting the Record Straight

This column has a reputation, in some quarters, as an advertising blurb for one manufacturer. As of my editorship, it isn't any more. *80-U.S.* picks up the tab and I can say whatever I like, as long as I don't swear.

Here are some observations:

Plus: Disk owners who smoke, eat your hearts out! I puff on my pipe like a chimney as I write this with SCRIPSIT and the ESFs love the smell.

Plus: My two ESFs take less space than one tape deck.

Plus: They cost about the same as a disk drive and I don't need an expansion interface (which, of course, I have!).

Plus: The operating system uses just four (4 — count 'em) bytes of RAM unless I need data I/O, which ties up 914 bytes.

Minus: The new ESF for Model III is going to use 4K of high memory (you get I/O automatically) and you can't put any other stuff in protected high memory.

Looks like the best bet in the future for a minimum cost computer system will be a Model I Level II workalike and some conventional ESFs.

Program Listing for SLOWPOKE

```
10 ' -- POKE-LOAD FOR DELAY ROUTINE --
20 CLS:INPUT "ENTER YOUR SYSTEM SIZE (1
   6/32/48)";S
30 IF S<>16 THEN IF S<>32 THEN IF S<>48
   THEN 20
40 IF S=16 THEN X=127
50 IF S=32 THEN X=191
60 IF S=48 THEN X=255
70 POKE 16561,128:POKE 16562,X
80 A=130+256*X:IFA>32767 THEN A=A-65536

90 V=134+256*X:IFV>32767 THEN V=V-65536

100 FOR J=A TO A+12:READ B:POKE J,B:NEX
   T
110 PRINT "DELAY NOW IN PLACE"
120 PRINT"MEMORY SIZE IS SET AT" 128+25
   6*X
130 PRINT "TO ACTIVATE:  POKE 16389,"X
140 PRINT "TO DEACTIVATE: POKE 16389,79

150 PRINT "VARY SPEED BY :POKE"V",NN
160 PRINT "     MAXIMUM SPEED - NN=0"
170 PRINT "     MINIMUM SPEED - NN=255"
180 PRINT:PRINTTAB(9) "NOTE THESE VALUE
   S - THIS PROGRAM MAY THEN BE ERASED"
190 DATA 245,197,1,0,64,205,96,0,193,24
   1,195,120,29 ■
```

Decimal to fraction conversions

Let your computer do the thinking while you learn about fractions

Model I/III, 16K and up

Jim Klaproth, Associate editor

Let's see. When you multiply two fractions, do you invert and multiply, or is that in division? How do you find the least common denominator of those fractions? How do you add two fractions? Can't remember all those rules you learned back in grade school? Well, here is a wonderful program that allows you to let your computer do all of your thinking, and possibly teach you a thing or two about fractions.

This program was written in response to a college chemistry course exercise involving operations on multiple fractions. It was originally written for a TI-58 programmable calculator and was recently converted for the TRS-80. The 80 version has been expanded to include a basic 4-function fractional calculator.

What the program does is allow the user to enter a decimal number in double precision format, and calculate the corresponding fraction. The algorithm that accomplishes this is quite simple, but may not have occured to you. It also demonstrates a powerful use for one of the built-in math functions buried in your Level II ROM.

If we take a decimal such as .25 and invert it, we get 4. In this case, it yields a whole number. It is easy to see the relationship between the decimal .25, the fraction ¼, and the inverted decimal 4. The inverted decimal number turns out to be the denominator of the fraction. Let's look at another example. The decimal .5 inverted is 2, which is the denominator of ½. So far, so good.

Let's look at the decimal .75. Inverting it yields 1.33333333, which is not the denominator of ¾. What went wrong? If we look back at the previous examples, we see that the numerator in both cases was 1. The numerator of ¾ is 3. What if we multiplied the inverted decimal 1.33333333 by 3? We would get 4, the correct denominator. Are you still with me?

OK, let's design a program that will take a decimal number input and we will initialize a loop counter to 1. First invert the input decimal number and then test to see if it is an integer. If it is, the integer will be the denominator and the loop counter value will be the numerator. If it is not an integer, increment the counter and multiply its value by the inverse of the original number. Retest this result for an integer and branch to either the answer or loop back for another try.

Let's see how the decimal .75 would be processed. The first time through, the counter equals 1 and the inverse is 1.33333333, which is not an integer. Increment counter to 2 and multiply by 1.33333333, still not an integer. Third time through, the counter equals 3 and yields the value 4, which was an integer the last time I checked. The denominator is 4 and the numerator is 3. How about that!

Well, just how do we test for an integer? We do that by using the FIX function in Level II. FIX truncates, or removes, all digits to the right of the decimal point. If we subtract the truncated number from the original, the result will tell us if we have an integer or not. For example, FIX(45)=45. If we subtract 45 from 45, we will get 0 (zero). A number such as 45.099 minus FIX(45.099) will leave .099 as a result. By testing for a zero result, we can determine if the number is an integer. Neat, huh?

There is only one small problem with this. Some numbers are not always going to come out as integers, even though they should. This is a result of having only 16 digits of precision in BASIC. To get around this, we have to allow a fudge factor in order to detect every integer. Therefore, this program may not find the correct solution when dealing with very large denominators. I have tested it with up to five digits in the denominator with no problem.

The other part of the program allows the operator to enter two fractions and one of the basic four math functions, and arrive at the correct answer (expressed as a fraction). Each fraction is converted to its double precision decimal equivalent and then merge with the proper sign. The result is run through the converter. No guarantees are made on accuracy when dealing with denominators over two or three digits, due to the fact that the double precision errors are increased by a factor of two or more.

One caution about inputting decimals into the

converter: always enter them as double precision. To get the double precision decimal for ⅓, simply enter the number as ⅓D. The D tells the interpreter that you are asking for a double precision solution.

This program may not be the most efficient way to convert a decimal number to a fraction, but it is the only way this would-be mathematician could figure out how to do it.

Program Listing for Decimal to Fractions

```
10 REM * DECIMAL TO FRACTION *
15 REM * CONVERSION PROGRAM  *
20 REM * BY JIM KLAPROTH     *
30 CLEAR 100:DEFDBL A-Z
40 DIMI$,LC%,I#,C#,F1#,A#,DL%,S$,I%,S#,
  N#,D#,F#
50 CLS:PRINT CHR$(23)
60 PRINTTAB(2)"DECIMAL TO FRACTION PROG
  RAM"
70 GOSUB 1020
80 REM *** MENU
90 CLS:PRINTTAB(6)"D E C I M A L  T O
    F R A C T I O N   P R O G R A M"
100 PRINT STRING$(64,"=");
110 PRINT" THIS PROGRAM WILL CONVERT A
  DECIMAL NUMBER TO A FRACTION AND  W
  ILL ALLOW YOU TO ADD, SUBTRACT, MULTI
  PLY, OR DIVIDE FRACTIONS.";
120 PRINT STRING$(64,"=");
130 PRINT:PRINT:PRINT
140 PRINT"        CONVERT DECIMAL TO FR
  ACTION ..... 1"
150 PRINT
160 PRINT"        MANIPULATE FRACTIONS
  ..... 2"
170 PRINT
180 PRINT"        EXIT THE PROGRAM ....
  ..... 3"
190 PRINT@980,"ENTER YOUR CHOICE";
200 I$=INKEY$:IF I$="" THEN FOR DL%=1 T
  O 200:NEXT:PRINT@980,"
    ";:FOR DL%=1 TO 200:NEXT:GOTO190
210 I%=VAL(I$)
220 IF I%=1 THEN 260
230 IF I%=2 THEN 460
240 IF I%=3 THEN CLS:PRINT@538,"GOODBYE
  ":FOR DL%=1TO1000:NEXT:CLS:END
250 GOTO 200
260 REM *** MAIN PROGRAM STARTS HERE
270 CLS:PRINT"TASK: CONVERT DECIMAL TO
  FRACTION"
```

```
280 PRINTSTRING$(64,"=");
290 PRINT
300 INPUT"ENTER THE DECIMAL NUMBER (DOU
  BLE PRECISION)";A
310 IF A=0 THEN GOTO 300
320 PRINT@330,"THE DECIMAL ";A;" IS EQU
  AL TO"
330 IF A<0 THEN S=1 ELSE S=0
340 A=ABS(A)
350 LC%=1
360 I=1/A*LC%     'INVERT NO.
370 IF LC%/2 - FIX(LC%/2)<>0 THEN PRINT
  @590," * * WORKING * *"; ELSE PRINT@5
  90,"                    ";
380 C=FIX(I)
390 IF (I-C)> 1E-04 THEN LC%=LC%+1:GOTO
   360
400 IF S=1 THEN PRINT@397, "THE FRACTIO
  N  -"; LC%;"/";INT(I)
410 IF S=0 THEN PRINT@397, "THE FRACTIO
  N ";  LC%;"/";INT(I)
420 PRINT:PRINT:PRINTTAB(10);"ANOTHER C
  ONVERSION?  (Y/N)"
430 I$=INKEY$:IF I$="" THEN 430
440 IF I$="Y" THEN 260 ELSE IF I$="N" T
  HEN 80
450 GOTO 430
460 REM *** MANIPULATE FRACTIONS
470 CLS
480 PRINT"TASK: MANIPULATE FRACTIONS"
490 PRINTSTRING$(64,"=")
500 PRINT
510 PRINT"ENTER FRACTIONS AND FUNCTIONS
   AS FOLLOWS:"
520 PRINT"     NUMERATOR <ENTER> DENOMI
  NATOR <ENTER> FUNCTION <ENTER>"
530 PRINT"     FUNCTIONS ARE AS FOLLOWS
  :"
540 PRINT"         +   ADDITION"
550 PRINT"         -   SUBTRACTION"
560 PRINT"         *   MULTIPLICATION"
570 PRINT"         /   DIVISION"
580 PRINT:PRINT
590 PRINT"ENTER THE NUMERATOR FOR FRACT
  ION #1";:INPUT N1
600 IF N1=0 THEN 590
610 PRINT"ENTER THE DENOMINATOR FOR FRA
  CTION #1";:INPUT D1
620 IF D1=0 THEN 610
630 PRINT"ENTER THE FUNCTION SIGN ";:IN
  PUT S$
640 IF S$<>"+" AND S$<>"-" AND S$<>"/"
  AND S$<>"*" THEN 630 ELSE 650
650 PRINT"ENTER THE NUMERATOR FOR FRACT
  ION #2";:INPUT N2
660 IF N2=0 THEN 650
670 PRINT"ENTER THE DENOMINATOR FOR FRA
  CTION #2";:INPUT D2
680 IF D2=0 THEN 670
690 REM *** EVALUATE EXPRESSION
700 CLS
710 PRINT@0,"THE EQUATION IS:"
720 PRINT
730 PRINT:PRINT
740 PRINT@128,"(";N1;"/";D1;")";" ";S$"
   ";"(";N2;"/";D2;")";"  =";
750 F1=N1/D1
760 F2=N2/D2
770 IF S$="+" THEN F1=F1+F2: GOTO 810
780 IF S$="-" THEN F1=F1-F2: GOTO 810
790 IF S$="*" THEN F1=F1*F2: GOTO 810
800 IF S$="/" THEN F1=F1/F2: GOTO 810
810 REM * FRACTION FINDER
820 LC%=1
830 IF F1<0 THEN S=1 ELSE S=0
840 F1=ABS(F1)
850 IF F1=0 THEN PRINT F1: GOTO 970
860 I=1/F1*LC%     'INVERT NO.
870 IF LC%/2 - FIX(LC%/2)<>0 THEN PRINT
  @596," * * WORKING * *"; ELSE PRINT@5
  96,"                    ";
880 C=FIX(I)
890 IF FIX(I-C)=1 THEN I=I-1 : GOTO 910

900 IF (I-C)> 1E-06 THEN LC%=LC%+1:GOTO
   860
910 PRINT@596,"                    ";
920 PRINT@0, "THE SOLUTION IS:"
930 PRINT@128,"(";N1;"/";D1;")";" ";S$"
   ";"(";N2;"/";D2;")";"  =";
940 IF S=0 THEN PRINT"  ";LC%;
950 IF S=1 THEN PRINT"  -";LC%;
960 IF INT(I)=1 THEN 970 ELSE PRINT"/";
  INT(I)
970 PRINT:PRINT:PRINTTAB(10);"ANOTHER P
  ROBLEM?  (Y/N)"
980 I$=INKEY$:IF I$="" THEN 980
990 IF I$="Y" THEN 460 ELSE IF I$="N" T
  HEN 80
1000 GOTO 980
1010 END
1020 PRINT STRING$(32,"+")
1030 PRINT"            1
        .25  =   -
             2"
1040 PRINT
1050 PRINT"                 1
        .166667 =   -
               6"
1060 PRINT
1070 PRINT"                      1
        .333333333334 = -
                     3"
1080 FOR DL%=1 TO 1000:NEXT:RETURN ■
```

Color disk directory

A utility to enhance your DOS

Color Computer

Bob Waterhouse, Gardena, CA

This program will display the files (three across in a row) in a manner similar to that of the Model I/III. The program will also allow you to view only those files with a given extension which you define (i.e., /BAS). You also have the option of using a <*> wildcard to view all files with any extension, including dead files which haven't been overwritten!

This program can be invoked by merely typing RUN "DIRS". I gave this program the filename "DIRS" to differentiate from "DIR", used by the operating system. After the program starts, you will be asked for the DRIVE number, it will default to the drive number currently defined by the operating system. Next, you will be asked for the file extension. At this time, enter the file extension that you desire viewing. If you want to look at all files on the disk, you should enter an <*> which acts like a wildcard. After pressing <ENTER>, you will see the files on your disk, as well as the free space remaining on the disk. Although this program is written for a two-disk drive system, the user should find little difficulty in adapting it to a three- or four-drive system.

Dead files can be recognized by the absence of the first character in the filename. For example, if the file "DIRS" were killed on a diskette, it would appear as "IRS" when viewed with the wildcard option. Filenames that seem alien, and aren't present under the system "DIR" command, are dead files.

By leaving the program on your "0"(zero) drive diskette, and giving it the filename "DIRS/BAS", it will always be available to you as a utility to enhance your Disk Operating System.

Program Listing for Color Disk Directory

```
30 CLEAR1000
40 CLS:FORX=1TO10:PRINT:NEXT
50 PRINTSTRING$(31,"-")
60 PRINT"** LIST PROGRAMS BY EXTENSION
**";
70 INPUT"DRIVE#";D
80 IF D=1 THEN 90 ELSE 100
90 DRIVE 1
100 INPUT"FILE EXT";Z$
110 PRINT"FILE TYPE = /";Z$
120 FOR X=3 TO 11
130 DSKI$ D,17,X,A$,B$
140 C$=A$+LEFT$(B$,127)
150 NAM$(0)=LEFT$(C$,8)
160 EXT$(0)=MID$(C$,9,3)
170 FOR N=1 TO 7
180 NAM$(N)=MID$(C$,N*32+1,8)
190 EXT$(N)=MID$(C$,9+N*32,3)
200 NEXT N
210 FOR N=0 TO 7
220 IF Z$="*" GOTO 230 ELSE 240
230 IF LEFT$(NAM$(N),1)<>CHR$(255) THEN
 PRINT NAM$(N);"     ";:GOTO250
240 IF EXT$(N)=Z$ AND LEFT$(NAM$(N),1)<
>CHR$(0) THEN PRINT NAM$(N);"     ";
250 Q=PEEK(1517)
260 IF Q<>96 GOSUB330
270 NEXT N
280 NEXT X
290 POKE &HFF40,0
300 PRINT FREE(D)"FREE GRN:";D,
310 DRIVE 0
320 END
330 N=N+1:PRINT NAM$(N):RETURN
```

Gobbler
Model I/III
Superior Software
P.O. Box 11676
Kansas City, MO 64138
$16.95 cassette
$19.95 disk

Ever since "Pacman" hit the arcades, there have been quite a few simulations of the game made for the TRS-80 computer: Scarfman, TRS-man and Ghost are some of them. There is a new one out, by Superior Software, named "Gobbler." In playing the game and trying to judge it, I decided it would be best to compare it with the original "Pacman" arcade game, rather than putting it side-by-side with Scarfman.

What's the Story?

Gobbler is loaded using the SYSTEM command since it is in machine language, as are most good arcade games. After getting the program to run, an impressive title page appears announcing "Superior Software presents . . . Gobbler." After hitting ENTER, the title page clears.

One thing found in this game (that is not found in Pacman) is the ability to chose a skill level. Any skill level, from one to four, may be selected, depending upon the difficulty you would like. One or two players may play the game, a feature not found in the game "Scarfman" by Phil Oliver.

After those two options, the game begins. The maze is very "dense"; that is, there are many parts. Instead of being just a few lines with a very loose maze configuration, the programmer has packed as much maze as he could onto the screen.

The player is represented by a figure which may be moved around the screen by arrow keys. One thing that I do not like about the controls, though, is that you must hold them down to move. In Scarfman, pressing an arrow key will take you as far as you can go. Gobbler does not do this.

This trouble with directions can make for some pretty difficult manuveurs. Trying to squeeze through parts of the maze is especially difficult by having to hold down the arrow keys contantly and having to be in precise positions to move. One soon gets used to it, however.

Skillfully Crafted

Depending upon the skill level chosen, one or more men will begin the chase. Gradually, all of them are after you, and they do a pretty good job of chasing you. Eating a "big dot" will give you the ability (for a short time) to consume your enemies for points (as in Pacman).

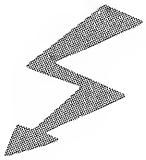
If you are fortunate enough to complete the game with a high score, there is a part where you may enter your name for the glory of it. It is very similar to the arcade-type way of inputing high scorer's names, thus bringing this emulation even closer to the real thing.

Point /Counterpoint

This game has advantages and disadvantages, just like any other game. The sound is good, and so are

the graphics. Gobbler is an excellent reproduction of the original "Pacman," and for all arcade fans, I recommend that you buy Gobbler.

Tim Knight



DOSPLUS User's Manual
TRS-80 Model I/III
Advanced Operating Systems
450 St. John Rd.
Michigan City, Indiana 46360
(800) 348-8558
$29.95

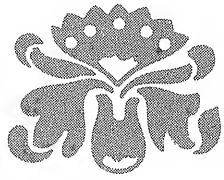
Reviewers of the DOSPLUS operating system have noted that only marginal documentation has been provided for this otherwise excellent piece of software. The documentation of DOSPLUS version 3.3 consisted of 46 pages of material, which was at best, a sketchy augmentation or amendment of the Radio Shack TRSDOS/DISK BASIC Reference Manual.

The offering from Advanced Operating Systems consists of an attractive looseleaf display binder with 120 pages of printed documentation of DOSPLUS 3.3. The format is 5½ by 8½ inches with a standard three-ring punch. Selection of good paper and a variety of bold face and italic gothic fonts make for readability and quick reference. Green "highlighting" of displays helps to round out the presentation.

The technical section introduces RAM addresses of DOS calls which can be accessed from machine language programs. These include I/O (disk, printer, video, and keyboard calls), and a full table of error messages. In addition to the technical section, all of the extensions, library commands and utilities unique to DOSPLUS are well covered in the new manual. The writers still assume a familiarity with the operating protocols and information contained in the TRSDOS manual and the DOSPLUS user is well advised to have one available.

The format makes the manual convenient, as it fits easily beside the TRS-80 or LNW-80 keyboard. A fold-back cover turns the notebook into a display binder, increasing its convenience. The serious user can readily augment the manual as there is room for another 150 looseleaf pages. I find this to be an expensive, but handsome and worthwhile, addition to my DOSPLUS system.

Captain Paul M. Hine, USN



The UPI-3
Serial Interface
for TRS-80
Model I
Binary Devices
11560 Timberlake Lane
Noblesville, IN 46060
(317) 842-5020
$139.95

A problem which many TRS-80 owners have experienced is the inconvenience of using a serial printer with the Model I. Use of the former is not possible without an interface such as the RS232C, and generally, a printer driver (a machine language program stored in protected high memory). The expansion interface provides a "Centronix-type" port for a parallel printer, but Radio Shack made no provision for serial printers other than the RS232C board.

For serial printer owners, the simultaneous use of the RS232C for telephone communications and hardcopy was not easily achieved since the RS232C was generally used by both the printer and the modem. Because of these difficulties, various articles have been published which detail alternative solutions; "Build Your Own Parallel-to-Serial Interface," etc. For those of us who are not adept with soldering irons, schematic diagrams, and the building of power supplies, there is an excellent product available which will solve your problems with ease: the UPI-3 from Binary Devices.

Of the various interfaces which are commercially produced (I have personally installed and used four

different brands), the UPI-3 is both the most versatile and the easiest to use. The UPI-3 Interface is simple to install; it plugs directly on the parallel printer edge-card of the expansion interface. A plug-in transformer provides the power to the UPI-3 and must be connected to 110-120-volt AC outlet.

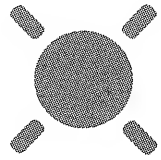
Many parallel-to-serial interfaces require that the user supply the voltages to power the interface, either from the TRS-80, the printer, or a separate power supply. Although many users have successfully obtained the required voltages for other parallel-to-serial interfaces from the expansion interface, the separate power supply which is included with the UPI-3 is far less taxing to the system and is much easier to install (no soldering, wiring or even opening of the expansion interface).

When using the UPI-3, the computer "thinks" it is communicating with a parallel printer. If a program won't work with the UPI-3 and an ASCII serial printer, it won't work with a Radio Shack parallel printer either. It, therefore, takes the place of both the RS232C interface and the nuisance of a machine language driver.

A variety of options are available to the user which make the UPI-3 an adaptable piece of computer hardware. Included in the interface are eight dip switches which allow the user to set the configuration of the interface to match that of the printer. Handshaking, line feed after carriage return, nulls after carriage return, odd or even parity, number of bits per word, number of stop bits, parity/no parity, and adjustable baud rate (110 to 4800) are options. Binary Devices will adjust the baud rate to your specifications.

The UPI-3 is shipped with a 90-day warranty from the date of delivery. The interface is everything that I expected, and I am happier with this piece of hardware than any I have purchased for my TRS-80 Model I. Although the price may seem high, the product is excellent. Support from the manufacturer equals the excellence of the product. My dealings with Binary Devices have convinced me that they are a reliable company who stands by their products. If you have the driver blues, the UPI-3 may be the best solution to your problem.

William Ramsey



Computer Based Math Lab
Model I/II/III/16
Entelek Incorporated
42 Pleasant Street
Newburyport, MA 01950
$24.95 Paperback

This text is a good example of the best and the worst in software. The book contains 35 CAI (computer assisted instruction) programs, all written in BASIC. The introduction to the user tells him to copy a relevant program into his terminal, and then let the students go to it. Sorry. It's not that easy.

A number of the programs make use of data files for their execution (e.g., values of coefficients, etc.), yet you are given no information about their contents or purpose. To be able to implement the program, you have to study it carefully and deduce what the file must contain to make any sense out of it. The programs are not well remarked, which gives an added challenge to the problem. Development of the programs in the book began in 1968, and BASIC has undergone much evolution since then. I did expect to do some conversions due to dialect differences, but reconstruction of data files is too much to expect.

Now, some of the good news. Once a program is up and running, it does a fine job of emphasizing the concepts covered. The programs are well-suited to a high school mathematics curricula. There are 11 programs that work to increase a student's skill at estimation of roots, trigonometric values, powers, logarithms, solutions to quadratic, linear or cubic equations. Nine programs develop the introductory concepts of probability and statistics, including a Monte Carlo trial to estimate areas and volumes of figures. Six programs work on polynomials and solutions, two on rational versus irrational numbers,

and another two programs that look at graphs and numerical analysis of functions.

The programs are written with a view toward time-share BASIC, so no use is made of TRS-80 graphics. Any graphing to be done is printer-oriented, so either turn your video sideways, or change appropriate PRINTS to LPRINTS.

The text is a Xerox copy of program listings, and some are difficult to read. One program in the Table of Contents was not included. With each program is an introduction that identifies the objectives, methodology used and theory behind the concepts presented. You also get a sample run of a student's use of the program. This was invaluable in deciphering how to get the routines to work. At the end is an Appendix that coordinates each program to chapters and sections of most currently-used high school texts.

The authors state that the text is experimental and they desire the readers comments. I hope that the second draft is out soon, the programs are worth having, but no instructor has the time to make the large number of modifications needed.

Cam Brown

Armored Patrol
Model I/III
Adventure International
Box 3435
Longwood, FL 32750
(800) 327-7172
$19.95 cassette
$24.95 disk

Reveille sounds! Boy, 4:30 a.m. seems earlier every day. After breakfast and a workout, you hop into your massive T-36 tank. Knowing this may be your last day, you lay your hands on the computer keyboard of this planet's most sophisticated land weapon. Feeling the energy through your fingertips, you press the correct sequence and begin to search for the invading tanks and robots.

Armored Patrol from Adventure International is a fast, exciting arcade-type game. The object is simple: destroy the enemy tanks and energy-stealing robots. You're sitting inside of your tank looking out onto the horizon. Being an elite weapon, your tank is equipped with the ultimate plasma weapon and radar. Radar indicates direction to the enemy. It will indicate left, right, forward or rear. If a robot should appear anywhere, an asterisk will appear in the center of the radar screen. No indication of direction to the robot is given, though. Robots fire at your tank, drawing energy from your initial 20 units. If your tank's energy should reach zero, the tank will be destroyed. Your fleet consists of four tanks with an extra awarded at 20,000 points. Enemy tanks score 1000 and robots 5000.

Movement of your tank is somewhat tricky. It is *not* done with arrow keys. Some tankers might find this annoying. I, however, have played similar games in arcades, and can tell you that a great deal of the challenge to this game is in learning the controls. I'm glad the authors didn't choose the easy way out.

Obstacles, actually small buildings with windows, are placed throughout the landscape. You can even see the enemy through the windows. Buildings may not be destroyed or run through. You must go around them. The bad guys just love to hide behind buildings. After you have the enemy in your sights, you fire a plasma blast (space bar) to destroy him. Don't forget—he will be firing at you, too!

Robots appear from time to time to gather energy from your tank. They're easily destroyed with a plasma blast when found. Figuring out where they're at is the hard part. Visually, they're very clever. They appear to be double six-gun totin' cowboys. I'm almost sure they have a Scott Adams smile when they kill you, but I could be wrong.

The game is a real-time machine language program. It must be CONVERTed for a Model III. Available on tape or disk, it will save high scores on the disk version. It plays smoothly with great graphics and sound effects. Sometimes the sound effects are even too clever. Armored Patrol is

another great arcade-type game from Adventure International.

Mark Renne

Space War
Color Computer
Spectral Associates
141 Harvard Avenue
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$21.95

Combine tricky space currents and gravity from a black hole and what do you get? A very unique *and* challenging new color computer game.

Even if you spend a lot of time (not to mention money) mastering arcade games, you'll have to start from scratch when you pick up the joysticks of this new Spectral Associates game.

The game starts out with a black hole on the left side of the screen and the Death Star on the right. Both objects are stationary, so when the game starts up you think, "It looks pretty easy." Then your ship is placed on the screen and you try to advance closer to the Death Star to pump a few shots into its shields. Suddenly, you find your ship moving in a totally *different* direction, being slowly sucked up by the powerful black hole. You start to get the feel of the controls, so you thrust in the direction that the black hole is pulling you and (with the added speed it gives you), break away from its gravitational clutches.

Then comes the hardest part of the game: sitting still so that you can score points by hitting the Death Star's shields while tricky space currents push your ship in different directions. Eventually, the shields will weaken and you can break through its defenses and destroy it completely.

The Death Star has some built-in defenses, like four invisible "space mines," and an occasional quick shot at your ship. The mines become visible when you venture too close to them and blow up about a second after they become visible. As if this isn't enough to stop you, a killer space ship (drone) pops in from hyperspace to have a shoot-out.

A meteor occasionally speeds across the screen. It can't be destroyed. You can get points for shooting and hitting it, but the shots don't alter its speed or course.

There are sixteen levels of difficulty with the gravity of the black hole getting stronger and the Death Star shooting more frequently. Also, as the difficulty levels go up, the speed of shots per second that you can fire goes down. Your ship does have a helpful cloaking device which makes it completely immune to meteors, drones and mines. You have a limited amount of cloaking time available and it should be used only in extreme emergencies.

The right joystick is used for rotating the gun turrent on your ship, and the right button is the cloaking button.

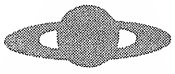
The left joystick controls the thrust, and that joystick button controls either single, or (if you hold

it down) rapid fire.

I encountered no errors while loading the game and could find nothing wrong with the program while executing it.

I would recommend it for two players, although one player could probably do all right with a little practice.

Richard Rehaume



Three CAI Programs
Model I/III with 16K
Cassette $12.95 ea.
Edu-Soft
4639 Spruce Street
Philadelphia, PA 19139

Our school recently purchased a number of programs from Edu-Soft for CAI purposes. Each one is a gem. Each tape comes with two programs on it for only $12.95.

The first tape (catalog #T-03) included the program's plot and "Guess the Rule." The plot routine is as good a program for graphing equations as I have ever seen on the TRS-80. You can enter up to two equations at one time and have them graphed simultaneously, (I do wish both graphs were not using SET commands since the overlap is hard to follow). The results can be saved, new equations entered, and comparisons made. Any function that can be written in BASIC is allowed, undefined values create no problem. You have complete control over X and Y axis limits. The routine is clean and simple, although it does take some time while plotting the values.

Our department sent for this tape for the plot program, but the second program will probably be more popular with our instructors. The routine called "Guess the Rule" is just that. A student is presented with X and Y values and is asked to figure out the Y= ??. The computer randomly selects the coefficients for linear (Y=AX+B) and quadratic (Y=AX*X +BX +C) functions. Points are awarded for guessing correct X,Y values and then guessing the complete function. The graphics and display for this program are excellent.

Our second tape (catalog #T-04) contains the programs "Simulated Computer" and "Computa-Doodle." Simulated Computer will give your students (and yourself) an excellent introduction to machine language programming. You have a set of OP codes and registers. By writing simple programs in this "language," you can actually see what is going on inside of a computer. The program even allows for display options: RUN SLOW (I used that one often), and RUN AT NORMAL SPEED. You can even edit your routines without having to reenter. I can't think of a better way to be introduced to the inner workings of a computer. With the program is an excellent manual that includes simple lessons and questions for study.

The other program on this tape is Computa-Doodle. Here, you can move a dot around the screen, draw lines, and shift your picture up, down, right or left. There are some options that make this "Etch-A-Sketch" routine more useful than most. Sketches can be saved to tape for input later, and you can command that a given sketch be listed out in graphics codes (CHR$ values) for use in other programs.

The last tape we ordered (catalog #T-05), includes two programs aimed at practice with integers. The "Integer" programs drills student on the four operations: +, -, ×, and /. Good graphics present each problem in larger-than-life symbols, and students easily master running the program. The "Estimate" program is a drill guessing an approximation for the multiplication of whole numbers. Students are scored as to their accuracy and speed. Again, the graphics are large, clean and easy-to-read. Student input is a breeze. The estimation routine can be excellent when trying to get your students to check answers for reasonableness

At only $12.95 per tape, these are an excellent buy. All programs are in BASIC, loaded from tape with no problem, and can easily be put to disk. Each tape came with a simple booklet of instructions. I am looking forward to our next catalog from Edu-Soft. They seem to know how to write just what a school needs (and can afford).

Cam Brown

Dental Computer Newsletter

E. J. Neiburger, D.D.S., Editor
1000 North Avenue
Waukegan, IL 60085

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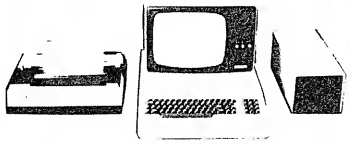

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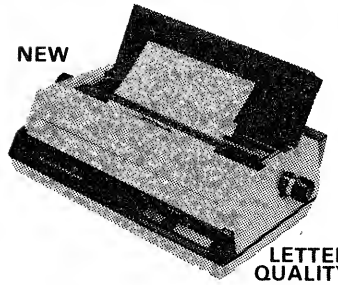

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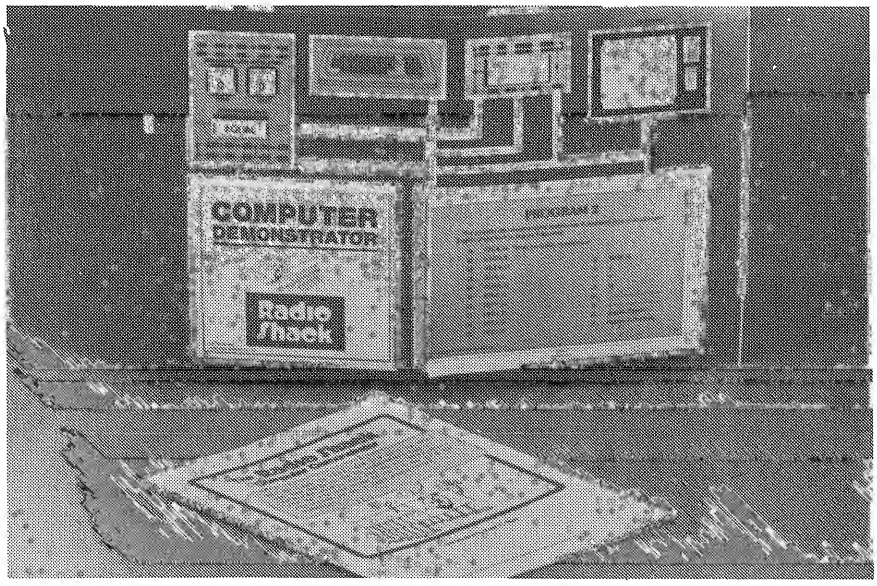
New Products

New Computer Demonstrator

Radio Shack now offers both parents and educators an inexpensive way to introduce young children to the way a computer operates with a cardboard training aid and accompanying manual workbook. The Radio Shack Computer Demonstrator (62-1080) is available for $3.95 at Radio Shack stores, Computer Centers and participating dealers.

The cardboard Computer Demonstrator measures an easily-manageable 8.5 x 16 inches. It uses sliding cardboard strips to illustrate various computer functions. These include program line number indicator; and equal/unequal number comparing unit; "keyboard" input; "TV" output; a storage unit; a register; and a print function completed by the user. Arrows on the demonstrator card indicate the sequence of functions by charting the direction of work flow.

#200



ColorForth

ColorForth is a fig Forth version of Forth, tailored for the TRS-80 Color Computer. It requires at least 16K of RAM but *does not* require Extended BASIC. In addition to the standard fig Forth words, ColorForth has several additional words to customize it for the Color Computer. Among these are CSAVEM(for non-Extended BASIC users), and special DUMP and printer functions. ColorForth includes the standard fig editor. Cassette and disk versions with manual are $49.95, available from Armadillo Int'l. Software, P.O. Box 7661, Austin, TX 78712.

#201

New Video Monitor

Replacement picture tubes with green and orange phosphor and an anti-glare face are now available for TRS-80 Model II and III microcomputers from Langley-St.Clair Instrumentation Systems of New York City.

The new "soft-view" CRT brings the green or orange letters out of a nearly black field, increasing contrast and readability. With flicker eliminated, it is like looking at a printed page, and the optional "Data-view" frosted faceplate substantially cuts glare. The picture tubes are shipped with the metal mounting band and ears already attached, and installation only involves removing a few screws and plugging in the new tube. Extensive installation instructions are included. Available for $79.95 (green) and $89.95 (orange) from LSI Systems, 132 West 24th St., New York, NY 10011. The optional anti-glare "Data view" etched faceplate is an additional $10.00

#202

Softside Sampler

The Softside Sampler of TRS-80 Entertainment Programs is a compilation of the 29 most interesting and entertaining programs published in *Softside Magazine*. Edited by Joan Witham and published by the Hayden Book Co. Inc., of Rochelle Park, NJ, the 199-page book offers a variety of short, simple programs and longer, more complex adventures. Size is 6 x 9, price is $8.95, available from Hayden Book Co., Inc., 50 Essex St., Rochelle Park, NJ 07662.

#203

CC Home Money Minder

Computerware has introduced The Home Money Minder, a checkbook manager program for the Color computer. It can tell you in a

nutshell how much money you have spent on what and where your income came from. It provides reports and makes tax time a snap. The program requires 32K, Extended BASIC and a cassette recorder. The Home Money Minder is available from Computerware, Box 668, 4403 Manchester Ave., Encinitas, CA 92024 for $19.95 plus $2 shipping and handling.

#204

Dr. Lien Announces New Book

CompuSoft Publishing of San Diego, CA just released the latest book in the CompuSoft learning series — *Learning TRS-80 BASIC for Models I, II/16 and III.* This new text was written by David A. Lien, who also wrote the original Level I User's Manual and *Learning Level II.*

Learning TRS-80 BASIC, according to Dr. Lien, is the ultimate tutorial work for anyone wishing to learn TRS-80 BASIC or expand programming knowledge. Written in the relaxed and amusing Lien style, this book leads the beginner step-by-step through the many aspects of BASIC programming. The book is available for $19.95 plus $2 shipping & handling from computer and book stores or directly from the publisher at 1050 Pioneer Way, Suite E, El Cajon, CA 92020.

#205

Syzygy Switchbox

Syzygy announces the availability of their RS-232 Serial Switchbox (P/N 232SB). The box measures 7 x 10 x 3 and permits manual switching of a common port to any of three distribution ports. All components are solidly mounted on a 9 x 6 inch printed circuit board. There are four internally mounted 10-pole socket-mounted DIP switches which allow each port to be seperately configured for normal or null-modem use and can enable, disable and jumper lines 4,5,6,8 and 20. The versatile switching permits rapid configuration of the box for CRT terminals, printers and CPU ports. A CPU port may select any of three different printers or terminals, or three different CPU ports may select one printer or terminal, etc. No batteries or external power is required and no wires are used. For more information contact Syzygy, 256 West San Bernardino Road, Covina, CA 91723.

#206

Small System Network

Radio Shack now offers an improved small system network capability with up to 16 TRS-80 Model III computers accessing a host TRS-80 Model III computer's disk drives and optional printer. The new Network 3 Controller (26-1212) is available for $599.00 at Radio Shack stores, Computer Centers and participating dealers. The Network 3 Controller allows each of the 16 workstations (which require no disk drive, but do require the RS-232C interface) to function as if they were independent, disk-equipped computers able to execute disk load and store commands. They are, in fact, communicating these commands to the disk-equipped host computer. Each station has the capability of printing either on a printer attached to that individual station, or on a printer connected to the host computer.

#207

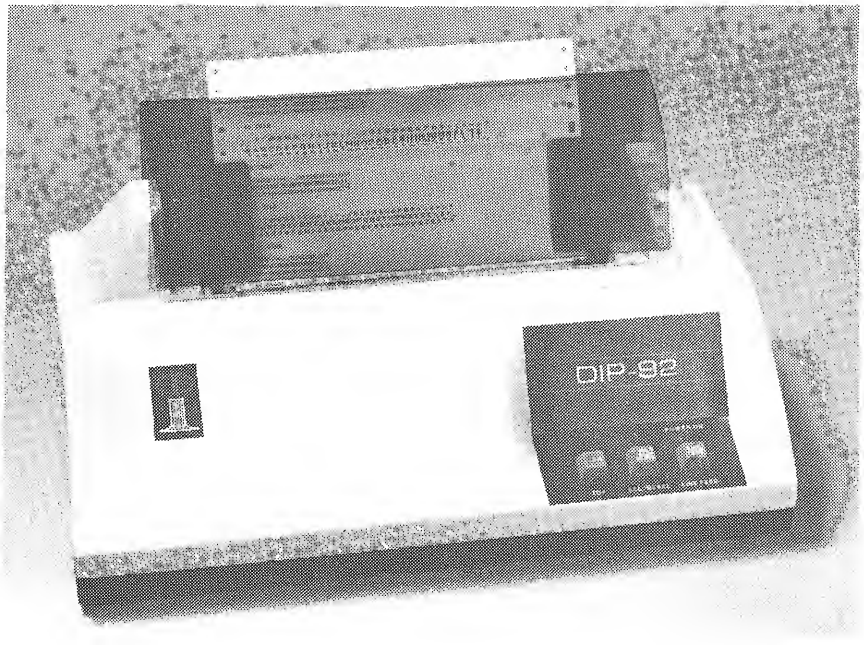
New Book from Radio Shack

The Beginners Guide to Personal Computers (62-2003) from Radio Shack, is a comprehensive guide to personal and business computer applications for the novice. The book, written by Forrest M. Mims, III, is available for $1.95 at Radio Shack stores, Computer Centers and participating dealers.

Dual Mode Impact Printer

Data Impact Printer, Inc., (formerly known as DIP, Inc.) announces the DIP-92, the industry's first totally modular and dual mode impact printer. It is modular because the user can specify and pay for only the features he needs. It is dual mode because the printer can do data processing printing at a higher speed as well as correspondence printing for good letter quality. The DIP-92 has two basic program selectable printing modes. The data processing mode uses a 7 x 9 matrix font, while the correspondence mode uses an 11 x 9 font. With each printing mode, under program control, the user can specify six different character sizes and one or two-pass printing. The 11 by 9 font, with two-pass printing, as well as descenders and underline, enables the DIP-92 to produce correspondence quality documents. The single unit list price for this printer is $695.00. It is available from Data Impact Printer, Inc., 745 Atlantic Ave., Boston, MA 02111.

#208



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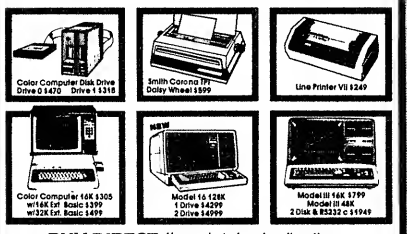

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This friendly, easy to use version of Stondord Poscol, as reviewed in the December 1981 **Byte**, is now even better! New version works on TRS-80 Model I and Model III, under TRS-DOS, NewDOS, NewDOS 80, DOSPlus, LDOS, and DoubleDOS. An author package allows you to create your own /CMD files without any royalty payments! Upper and lower case is fully supported. You can protect memory and call machine language programs. New extensions include SET, RESET, POINT, RND, and the UCSD Include procedure. Utilities are provided to convert to and from ASCII files. Pascal 80 now comes in a binder with an 80 page manual by George Blank.

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Bulletin Board

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THE TRS-80 MODEL I Users Group of West Los Angeles is a informal users group which meets the last Tuesday of each month. All users are invited to attend and participate in the exchange of ideas and public domain software. For further information call (213) 836-4103.

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FOR SALE OR TRADE: PMC-80 (16K, Level II TRS-80 workalike) for sale $450.00 or will trade for OSI C4P or K1M — compatible boards. PMC has lower-case mod installed, plus some software and books. Paul Miller, 7623 Pecan Villas #7, Houston, TX 77061, (713) 799-5509 days, (713) 641-3923 nights and weekends.

I HAVE JUST BOUGHT THE MX—80 with 2K buffer. I am unable to LLIST or PRINT#-2 or (P)rint from the Color Computer. Anyone with a solution please contact me: John Gordon Reid, 40-15 — 61 St. Apt. 3H, Woodside, NY 11377.

WHERE CAN I FIND games like Bridge, Cribbage, Gin Rummy, Eukre, Pitch, Hearts, Pinochle and Solitaire for the Color Computer? If you know, contact Charles Marvin, 3112 Latimer Road, Rock Creek, OH 44084.

I NEED LEADS towards interfacing the H-P Optical Wand or other optical wands with the Model I TRS-80, and/or software to read/write information in bar code format. J. Trinque, 7 Terrance Ave, Clinton, MA 01510.

I HAVE A TRS-80 Color Computer 16K, Ext. BASIC Rom 1.1 and an Epson MX-80 with graftrax and interface board #8150 with 2K buffer. I want to be able to draw a picture on the screen using a short program such as "polygon" or "joystick draw" and then print the result. Also, I have the art gallery ROMPAK and would like to draw or create a picture then save to tape and load it back in and print it. Is this possible? Mike Davis, 6166 Char Mar Drive, Westerville, OH 43081, (614) 882-1954.

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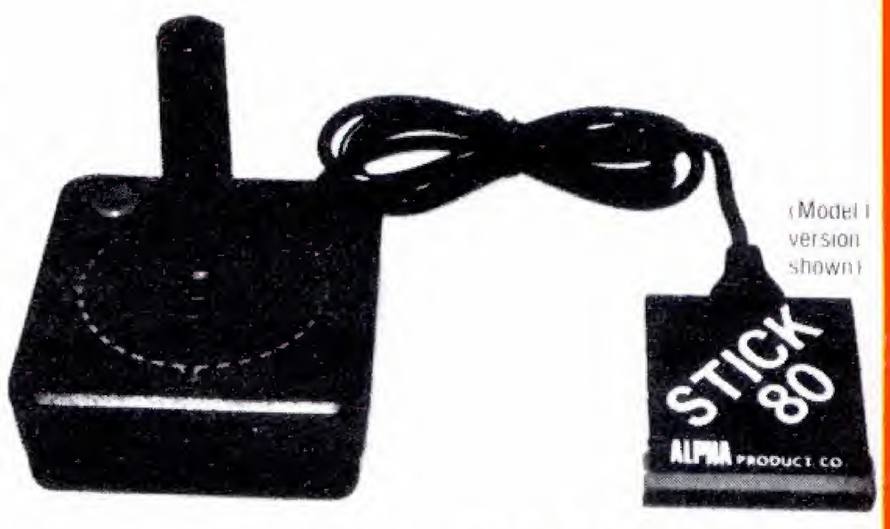

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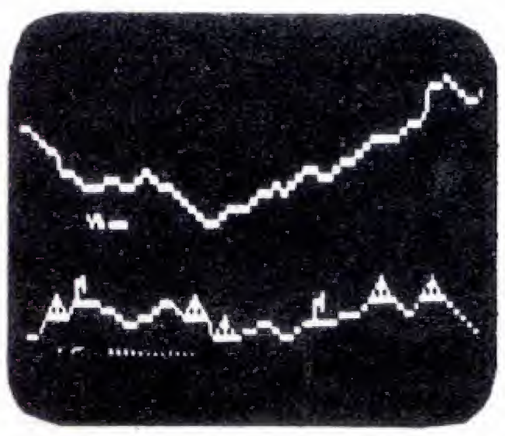

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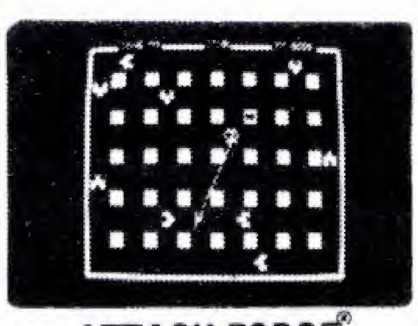

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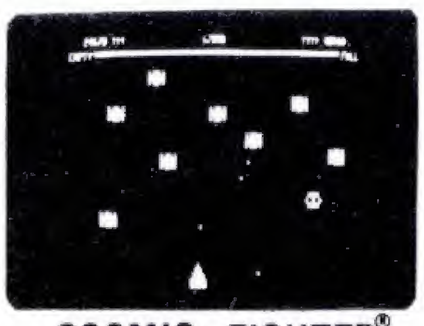

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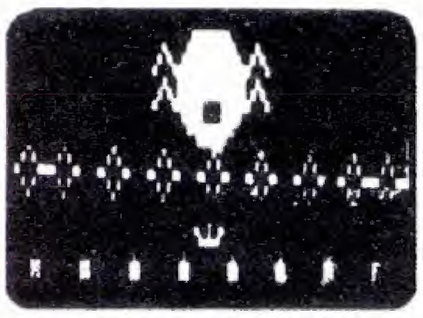

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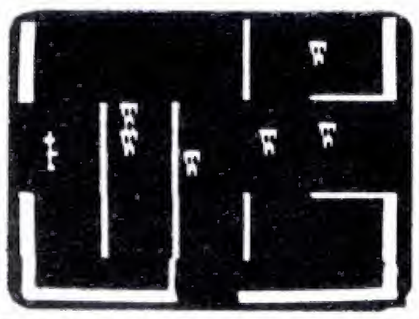

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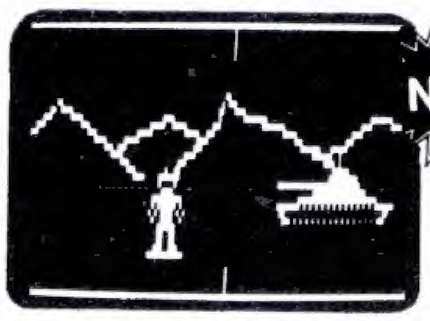

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